

[From the REPORT of the BRITISH ASSOCIATION for the ADVANCEMENT of SCIENCE
for 1861.]

REPORT

ON THE

ACTION OF PRISON DIET AND DISCIPLINE

ON THE

BODILY FUNCTIONS OF PRISONERS.

PART I.

BY

EDWARD SMITH, M.D., LL.B., F.R.S.,
ASSISTANT PHYSICIAN TO THE HOSPITAL FOR CONSUMPTION, BROMPTON;

AND

W. R. MILNER, M.R.C.S.,
SURGEON TO THE CONVICT PRISON, WAKEFIELD.

WITH APPENDICES.

LONDON:

PRINTED BY TAYLOR AND FRANCIS, RED LION COURT, FLEET STREET.

1862.

THE Committee appointed at the late Meeting of the British Association, "to prosecute inquiries as to the effect of prison diet and discipline on the bodily functions of prisoners" have the honour to state that they have fulfilled the task assigned to them so far as time and opportunity have permitted; but they regret that, on the one hand, they have not been able to gain access to some information which they required, and, on the other, that the great extent of the inquiry has prevented the completion of the series of researches, to which they attach great importance. Hence they purpose on the present occasion to present the first part of their report, which will include some general remarks on the management and present system of dietary and punishments in county gaols, with the various researches which they have hitherto made into the influence of prison discipline over the weight of the prisoners, the precise influence of prison punishments over the respiratory function and the elimination of urinary products, with the ordinary discipline of the gaol and with certain forms of labour.

In conducting their researches the Committee have had in view not only the letter but the spirit of the resolution by which they were appointed, and have understood their prime duty to be the elimination of important physiological facts, for which the discipline enforced in gaols offers good opportunities. Whilst, therefore, determining the various matters which will be discussed in this the first part of their report, they have also been very desirous to investigate some of the more recondite questions in nutrition—as, for example, the relation of the nitrogen ingested to that egested; and having obtained the valuable aid of Mr. Manning in making chemical analyses, they have concluded two extended series of inquiries at Coldbath Fields and Wakefield Gaol, in which the relations of the ingested and egested nitrogen have been largely inquired into; but the great care required in this part of the inquiry, and the very extended character of the subject, have induced the Committee to withhold the results hitherto obtained until another occasion, when, should they be permitted to do so, they will present them with additional inquiries in the second part of their report.

With these explanatory observations, the Committee proceed to state the results of their inquiries, and, first, to offer some general remarks upon the management, the dietary, and the punishments in county gaols.

GENERAL OBSERVATIONS.

THE MANAGEMENT OF COUNTY GAOLS.

The management of county prisons is placed almost exclusively in the hands of the County Magistracy, and is therefore liable to as much diversity as there are Boards of Visiting Justices. The Secretary of State must approve of any "rules" within the meaning of the Act, and he also approves of the scale of dietary; but hitherto he has not exercised his power to insist upon uniformity in dietary; and hence, within certain limits, the Visiting Justices regulate the dietary. There are also three* (nominally four) Inspectors of Prisons for England, appointed by the Home Secretary, who visit the prisons periodically, and report their condition to the Home Office, and also suggest to the Visiting Justices from time to time such changes as they may think to be desirable; but they have no power to interfere with the orders of the Visiting Justices, if the orders are within the provisions of the law and the "rules" of the prison. Hence the sole authority in county gaols under normal conditions is the Board of Visiting Justices. There is a scheme of dietary which was recommended by the Home Office, under the administration of Sir James Graham; but it is not always adopted, and there is no plan whereby uniformity is ensured.

It thence follows that there is the greatest diversity in the gaols both as to punishment and dietary, and to a consideration of this your Committee directed their first attention.

A "Return of Dietary for Convicts, &c." was issued in 1857, which gives the dietary in the various convict and county prisons, but there has not been any general return obtained as to the nature of punishment inflicted, and the plan pursued in carrying out hard-labour sentences. As it was very desirable that some authorized information upon these points should be introduced into this report, Mr. Bazley, M.P., most readily and kindly undertook to move for one in the form given in the Appendix (II.), but, after having it entered upon the "Orders for the day," he failed to obtain the sanction of the Government, and withdrew it. The Committee venture to hope that the British Association may think this of sufficient importance to lend their aid in obtaining it during the next Session of Parliament, and would remark that, although the proposed return has a formidable appearance, its tabulated character tends to reduce, and not to increase, the expense of printing and the labour of writing.

PUNISHMENTS.

In the absence of this authorized return, the Committee quote the results of an inquiry previously made by Dr. Smith, who addressed a letter to the governors of upwards of sixty county gaols, and was favoured with their replies. The general expression of the results is as follows:—

"In our county prisons some find no labour at all, others only that of ordinary trades, others have crank-labour † alone, others treadwheel-labour alone, whilst in many one of the two, or both of the two latter forms of hard labour are conjoined with some kind of trade. In many the treadwheel and crank are unprofitably employed, whilst in others they are used as mills or pumps. In some, women even work some kind of crank and the treadwheel.

* The number is now reduced to two.—Feb. 1862.

† When the term "crank" is employed in this report, it is intended to indicate the instrument turned by hand, and technically known as the "hard-labour crank." This differs from other hand cranks only in that it is purposely arranged for non-remunerative work, and indicates the number of revolutions which have been made in a given period.

In some the treadwheel and crank are exceptional employments; in others they are universally used for a small part of the sentence; whilst in a third class they are the constant employments during the whole term of imprisonment. In most gaols they are chiefly employed for short sentences, and therefore for small crimes, and with insufficient food, whilst the light occupations are reserved for long sentences, with greater crimes, or frequent repetition of crime, and sufficient food. In some they are worked for an hour without intermission; in others thirty, twenty, fifteen, ten, and down to four minutes only at a time. In some they are enforced for three hours daily, and simply as exercise; whilst in others the labour endures ten hours. In many, boys of fourteen years of age work the wheel and the crank; whilst in others, able grown men make shoes or pick oakum only. In some the ordinary rate of the ascent on the treadwheel is fifty-six steps of 8 inches each per minute, whilst in others it is so low as thirty. In some the ordinary pressure on the crank is seven pounds; in others, twelve pounds,—the pressure being certain, and demonstrated by weights in one, and uncertain, depending upon the turns of a screw in another. In some the ordinary number of revolutions per day is 14,400; whilst in others, in which the crank is still the chief instrument of punishment, it varies from 13,500 to 7000 or 6000, at the discretion of the surgeon, the prisoner being in all these instances without disease. In some the day's work may be performed in any part of the twenty-four hours, with the index of the instrument in sight of the prisoner; whilst in others, as the New Bailey, Salford, it must be performed before the night and with the index outside the cell, so that the prisoner is unable to ascertain, from time to time, how much labour he has yet to perform. In some, pumping is employed for an hour only, and even during that short period, as at Reading, there is no method of determining if any individual prisoner is labouring or not; whilst in others, the labour is for the whole day, pumping water into the sewers.

"Oakum-picking is no labour in one prison, and hard labour in another; and in the latter it is two pounds for a day's work at Wandsworth, and three pounds at the Coldbath Fields, whilst it is five pounds at a workhouse; and the rope itself differs greatly in the amount of labour which is required to tear it to pieces. In some the prisoner, by good conduct, obtains lighter labour, a commendatory badge, and a pecuniary reward; in others it is tread-wheel labour from the beginning to the end of the imprisonment, whilst in many, as at Wandsworth, the change of labour is due neither to crime, sentence, nor conduct, but simply to the variation in the number of the prisoners.

"In addition to all this, in some prisons the separate system is strictly enforced and a mask worn, whilst in others hundreds of prisoners sit together in the room piecing oakum; and, finally, in some the cat is so heavy, and the officer's arm so strong and willing, that the prisoner is for a time made insensible to pain after a few strokes, whilst in other prisons it is so light as to leave very little evidence of its use."

Hence it appears that the utmost diversity exists in the different county prisons as to the instruments of punishment employed, the condition in which they are kept, the amount of labour which they exact, the amount of a day's work, the system of progressive change in the use of the various means of enforcing labour, and, in fact, in all that concerns the carrying out of the sentences of hard labour.

DIETARY.

In reference to dietary, the diversity is even more striking; for so various are the schemes contained in the "Return of Dietaries for Convicts, &c.,"

referred to, that it is impossible, by any method, to give an analysis of the amount of nutriment which they supply. An abstract of the most noticeable parts of the return is given in the Appendix (I.); and it is proposed to state in this place only a few general facts.

It is customary to provide several scales of dietary, increasing in the nutriment supplied according to the duration of the imprisonment; so that with the shortest sentences, as three, seven, or fourteen days, the only food given is bread and gruel*; whilst for prisoners condemned to long terms of imprisonment the diet is generally an abundant one of meat, vegetables, bread, and gruel. The terms of sentence to which these several classes apply vary in the different gaols; but usually a sentence of four months carries with it the highest scale of dietary. In nearly all gaols the prisoner is on entrance placed upon his proper scale of dietary; but in the Kendal, Carlisle, and other prisons he begins with the lowest scale, and gradually ascends as his duration of imprisonment continues.

It is also usual to vary the dietary from day to day; so that there is a considerable daily variation, not only in the kind and quantity of food, but in the amount of nutriment supplied. There is commonly an increased dietary given to those who are condemned to hard labour; but the modes in which sentences of hard labour are carried out differ so much, that this is practically valueless. There are gaols in which the treadwheel is worked for short periods with a dietary of bread and gruel only*. But in none is there any attempt to estimate in a scientific manner the amount of increase of nutriment which is proportioned to the increased labour. Usually there are three meals a day allowed (at St. Albans there were only two); and of these the first and last consist commonly of bread and gruel. The amount of flesh supplied in the highest scale of dietary varies greatly, as, for example, from 6 ozs. of cooked meat without bone in the Middlesex and Brecon Prisons, and $7\frac{1}{2}$ ozs. of uncooked meat with bone at Wakefield, to (until very recently) an entire absence of that food in the Cardiff Gaol. Very small quantities of milk, cocoa, oatmeal, cheese, and tea are given in a few gaols; but commonly the dietary consists of meat, soup, potatoes, bread, and gruel in various proportions, and with various systems of alternation.

The surgeon has power to add to the dietary if he should see fit; and such additions are commonly bread or milk. Bread and water are rarely given as an ordinary dietary*, except for "prison offences"; and for these the prisoners may be condemned to the dark cell and bread-and-water dietary for a period not exceeding three days at one time. If the prisoners have been condemned to hard labour, this most severe punishment may be extended to one month; but after three days he is fed on bread and gruel. Flogging is resorted to in various prisons as a part of the sentence upon prison offences, if the prisoner have been convicted of felony; and a return in reference to it has recently been issued. The gaols in which the largest number of prisoners were flogged for prison offences were those which had the most non-remunerative punishments; and in this respect the gaols at Manchester and Liverpool offer a striking contrast. In military prisons it is understood that the punishments are still more severe, since they are inflicted under the Mutiny Act; and it is very desirable that authorized returns should be obtained from them.

The foregoing general observations may suffice to show that he who attempts to ascertain the effect of the present system of prison punishments and dietary undertakes an inquiry of the widest kind, and, with the diversity

* In the Gloucester Gaol bread and water are still given as a dietary.

of system which exists, he will need to present nearly as many reports as there are gaols to be reported upon.

SCIENTIFIC RESEARCHES.

The Committee now proceed to consider the effect of prison discipline over the bodily functions of the prisoners, and will include in their report the result of the inquiries made by them into the variation of the weight of the prisoners, the excretion of nitrogen and carbon, the quantity of air inspired, and the rate of pulsation and respiration.

VARIATION IN WEIGHT.

The value of weight as an indication of the healthfulness and vigour of the body is one of a very general character only, and, when applied to test the effects of any agent over a number of men relatively to each other, is of little worth until all the men have been brought into nearly the same bodily condition. The weight of the body is due to many circumstances of very different values, as, for example, to the contained food and excretions, the amount of fluid in the circulation and in the tissues, the deposited fat, and to the size of the bones, quite apart from the nitrogenous elements to which reference is essentially made when an estimation is attempted of the vigour and healthfulness of men. Many of these elements can never be truthfully estimated; but in prison discipline it has been ascertained that some of them are removed during the earlier periods of imprisonment—as, for example, fat and superfluous fluid; and, with the reduction in weight which follows, the body gains a higher relative nitrogenous composition.

When, therefore, the body has been so reduced in weight by the labour and discipline enforced, the condition of the men may be compared with greater truthfulness, and weight will be a fair index of the vigour and healthfulness of the system. Hence, whilst investigations into the influence of prison discipline over the weight of the prisoners must be regarded as of great value, they must give place in importance to such as determine the influence of the discipline over each separate function of the organism.

Much difference of opinion exists in gaols as to the value of the test of weight; and in many it is so lightly esteemed that it is not applied at all. In other gaols it is usual to weigh the prisoners on entrance and discharge; and in a few the weight is taken monthly; but in none is it effected with such rigorous exactitude as to fit the results for the use of the physiologist. It is manifest that the weighings should be made before breakfast, and after emitting the excretions, and also that the prisoner should be weighed naked, or the clothes be weighed apart and the weight of them deducted carefully on each occasion; for otherwise the former will lead to an error of 2 lbs. in either direction, and the latter to an error of a smaller amount, even if the external clothing be the same on each occasion. This, however, is not attended to in any gaol, but the prisoners are weighed at various hours, and a standard weight is allowed for the clothes.

Mr. Milner has investigated this subject during a period of more than ten years, including several thousands of prisoners, and embracing the questions of duration of imprisonment, employment, season, and others of a subordinate importance; and to these the Committee will now refer. Appendix III.

The diet on the convict side at the Wakefield House of Correction is liberal and uniform, consisting of 20 ozs. of bread, 4 ozs. of cooked beef, $\frac{1}{2}$ pint of soup, 1 lb. of potatoes, $\frac{3}{4}$ pint of skimmed milk, and 2 ozs. of oatmeal. The dress is sufficiently warm. The prisoners have running and

walking exercise during nine hours per week, and are all employed in some manufacturing occupation, as mat- and matting-making, tailoring, or shoe-making. There are not now any of the proper prison punishments, as the crank and the treadwheel, used at that gaol. The cells offer a capacity of 900 cubie feet, and 35 cubie feet of air per minute for each prisoner, with a mean monthly temperature varying from $56^{\circ}9$ in March, to $66^{\circ}5$ in August. The average age of the 4000 prisoners under inquiry was $26\frac{1}{2}$ years, of whom 25 per cent. were under 21 years, and were therefore still at the period of growth.

In reference to duration of imprisonment, Mr. Milner states as follows:—

"Duration of Imprisonment."—I have divided the time of imprisonment at Wakefield into periods of two months each, and have tabulated six of these periods, so as to show the variation of the weight of the men during the first twelve months of their stay. (Appendix IV.) I have not carried the table any further, as very few prisoners remained longer than twelve months, and those that were detained beyond that time were chiefly invalids, and, consequently, cases from which no general inferences could be fairly drawn.

"The table shows the gains and losses in bi-monthly periods, and also the proportion of prisoners who had to be placed on the extra diet list, who were first placed on the list during each period. The number placed on extra diet during the first twelve months of their stay, was 1393, out of which number 3·14 per cent. were put on during the first two months, and 12·31 per cent. during the second two months.

"The stage of their imprisonment had evidently a very marked effect. During the first two months the majority gained weight; in the second bi-monthly period a large loss occurred, equal to nearly twice the amount gained in the first period; in the third period there was still a loss, but not to so great an amount; the next three periods show a steadily increasing gain.

"For a due understanding of these fluctuations, it is necessary to consider the circumstances under which prisoners are received into this prison. They are all brought from other prisons after having been tried and sentenced to various periods of transportation, or penal servitude; they have consequently passed through the period of anxiety which elapses between committal and trial, during which time, I have reason to think, men often fall off very much in condition and health. When we receive them their fate is decided, and they know the worst. In a large proportion of cases, I believe this is followed by a feeling of relief and by a reaction of the mind against the depression under which it had previously been suffering; later on, the continued imprisonment begins to tell and it becomes necessary to give extra diet to counteract its depressing tendency. A reference to the tables shows that it was thought necessary to give extra diet to a large number of prisoners during the fifth, sixth, seventh, and eighth months. The number of prisoners who were placed on the extra diet list for the first time during these four months, was nearly twenty-one per cent. of the prisoners in confinement, and 60 per cent. of the whole number who were put on extra diet during the twelve months.

"The effect of this addition to the diet is shown by the gradual and progressive improvement during the last three bi-monthly periods, when the amount gained, added to the gain of the first period, nearly restored the equilibrium of the mass.

"Prison Employment."—In Appendix V. the employments of the prisoners are distributed into five groups, putting into each group the classes of work-

men who, as a class, were most nearly associated in the average amount gained or lost during their stay ; and when arranged on this principle, it will be found that the groups also represent very accurately the amount of muscular force required to be expended in the respective kinds of work at which they were employed.

“ The *first group* consists of men employed in picking oakum, an occupation in which the labour is merely nominal ; and it will be seen that these men gained nearly two pounds each on the average, and that a large percentage of them were gaining weight. The oakum-pickers are placed in a group by themselves, as they consist principally of exceptional cases, a large proportion of them being men who, from weakness or infirmity, were unfit for real labour ; many were, on medical grounds, employed in the garden, and had extra allowances. The *second group* contains men working at sedentary trades, as tailors and shoemakers, as well as a few employed in writing and other light occupations. Of these men a large per-centaage gained weight, and the average gain was nearly a pound and three quarters per man. The *third group* comprises carpenters, mechanics, and men employed in winding the yarn into balls, or winding it on to bobbins for the mat-makers. The men in this group generally work standing, and therefore a greater number of muscles have to be brought into play. The weight of work, however, is thrown on the arms, and the legs have little more to do than to support the body in a convenient attitude. A smaller per-centaage of these gained weight, and the average amount gained was less. The *fourth group* contains the men employed in weaving canvas, in making mats in the loom or on boards, and also a small number (thirty-six) who were engaged in plaiting coir, or in binding mats. The work of all these men is decidedly heavier than that of the men forming the preceding groups, and the *majority of these were found to have lost weight*. The *last group* contains only one class of work, viz. the weaving of coir matting ; but the effects of this were so very decided that it was necessary to give it a place to itself.

“ The weaving of coir matting by hand is a very laborious occupation : the yarn is coarse and rough, so that the friction between the thread of the warp and weft is great, and to produce good firm work the weft has to be heavily and repeatedly struck, in doing which the muscles of the arms and trunk are brought into powerful action ; the legs have also to be employed in working the treddles, and, in consequence of the power required to work the loom, the weaver cannot work sitting.

“ The effect of this greater expenditure of muscular force is very manifest ; for nearly 80 per cent. of the men so employed lost weight during their stay, and the average loss per man was nearly seven pounds.

“ The influence of the various employments would have been much more marked if it had not been, in some degree, counteracted by the extra diet given to those men who were falling off very much in weight ; and the numbers to whom it was found necessary to give extra diet, in each class, also bore a pretty close relation to the amount of muscular force expended. Among the men employed in coir-picking, 26·8 per cent. had to be placed on extra diet ; in the second group 26·4 per cent. ; in the third 36·8 per cent. ; in the fourth group 39·4 per cent. ; while of the matting-weavers 60·1 per cent. required additional food.

“ *Treadwheel Labour.*—The Committee have not been immediately associated with inquiries into the influence of the proper prison punishments over the weight of the prisoners, such as the treadwheel, crank, and shot-drill ; but their inquiries warrant them in stating that the normal action of these punishments is to reduce the weight of the prisoners. In the absence of the

'Return' above referred to, it will not be possible for the Committee to discuss this influence satisfactorily.

"The only returns in reference to treadwheel labour which have been obtained are given in the Appendix (VI.), and have been kindly furnished by the governor of the Wakefield House of Correction; but they comprehend only a small number of prisoners, for the use of that instrument was discontinued in consequence of the serious loss of weight which it occasioned.

"The average loss of weight was 2·63 lbs. per man during the first week's labour, 4·57 lbs. at the end of the second week, 6 lbs. at the end of the third week, and 7·7 lbs. at the end of the fourth week. The progressive decension in weight with duration of labour is very striking; but it must not be presumed that it would be continued indefinitely, since a point must be at length reached when the weight would be so reduced that it will remain nearly stationary; and the time required to arrive at that point will vary with the fulness of the body, the tone of the tissues, the nature of the dietary, and the severity of the labour. The greatest loss of weight always occurs in the earlier weeks of imprisonment.

"Age, Weight, and Season."—On the subordinate questions of age, weight, and the season of the year, Mr. Milner found that those prisoners who were at the period of growth did not grow according to the scale observed in others more favourably circumstanced, but lost weight in an increasing ratio; so that, conversely, he found that the decrease in the virtual loss of weight occurred as the age increased. The prisoners gained weight from March or April to August or September, and lost in the winter months. The loss of weight of the prisoners varied as the height; so that the taller men required an increased quantity of extra food. Appendix VII., VIII., and IX.

"Summary."—On summing up the whole question it was found that, with the arrangements of that prison, which were more favourable than the average of prisons both in dietary and punishment, there was an average loss on the whole weighings, although 3635 of 4000 men were under forty years of age."

From the foregoing tables and remarks it will appear that the weight of prisoners is much below that of persons of the same age and height in a state of freedom, and also that loss of weight during imprisonment is the normal condition of prison discipline.

This result doubtless depends partly upon the relation of food and exertion, and partly upon the inability of the system to assimilate the ordinary food of mankind with a rapidity sufficient to meet the wants induced by constant and great labour. The Committee do not purpose on the present occasion to consider the question of the exact amount of food required to meet the wants of the prisoners; but as in the foregoing remarks reference has been frequently made to the necessity of giving extra diet in order to avert loss of weight, it is deemed right to introduce two interesting facts which came under Mr. Milner's observation.

Effect of Milk.—The effect of milk in arresting loss of weight was most striking, and in a degree far beyond that of the relation of its nutritive elements to the waste of the system. Thus the addition upon his recommendation of only $\frac{1}{4}$ pint of skimmed milk, containing not more than 7 grs. of nitrogen, to the daily dietary, was followed by a reduction in the extra diets from 22·55 per cent. in 1853 to 15·08 per cent. in the first nine months after the additions in 1854, 15·27 in 1855, 14·08 per cent. in 1856, to 9·56 per cent. in 1857. As the extra diets represent the cases permanently losing weight, it is manifest that milk was the proper remedy to meet the loss, and

that it acted not simply by supplying a small quantity of nitrogen to obviate the waste of the nitrogenous tissues, but in an indirect manner by improving the general nutrition of the system in the matter pointed out by Dr. Smith in the 'Phil. Trans.' of 1859.

Effect of Tea.—The effect of tea in lessening weight was also largely investigated by Mr. Milner in 1857, both as an addition to the ordinary dietary, and in substitution of the oatmeal contained in the gruel.

Four divisions of the prison, each containing between forty and fifty prisoners, were chosen for observation and comparison.

The divisions chosen were Nos. 2 and 3 in B and C wings.

The prisoners in the division No. 2 were chiefly employed in mat-weaving, and those in division No. 3 in mat-making.

The prisoners in the 2nd division of B wing had a pint of tea given to them *in addition to* the regular diet of the prison. The prisoners in the 3rd division of B wing had a pint of tea given to them *in place of* the pint of gruel served out for supper; the prisoners in the 2nd and 3rd divisions of C wing remained on the regular diet. All the prisoners in these four divisions were weighed every week during the continuance of the observations. At the end of the period the result was thus:—

	lb.
The prisoners in the 2nd division of B wing had gained on the average.....	0·31
The prisoners in the 2nd division of C wing had on the average gained	0·44
Showing a virtual loss by the prisoners who had had tea in addition to the regular diet, of	0·13
The prisoners in the 3rd division of B wing had gained on the average	0·01
The prisoners in the 3rd division of C wing had gained on the average.....	0·20
Showing a virtual loss by the prisoners who had had tea in place of gruel, of	0·14

Thus, so far as the results obtained from one set of prisoners may be compared with those obtained from other sets, it must be admitted that these experiments prove that the use of tea tended to lessen the weight of the prisoners, and consequently to show that it is unsuited as an article for extra diets.

RESPIRATION AND PULSATION.

The Committee now proceed to give the details of their inquiries into the influence of the agents under consideration over some of the vital processes of the body, and first those of the respiration and pulsation. The inquiries comprehend experiments as to the quantity of air inspired and of carbonic acid expired, and the rate of the functions of respiration and pulsation. In reference to the value of the quantity of respired air as a measure of vital action, the Committee refer to the inquiries previously made by Dr. Smith and published in the 'Philosophical Transactions' for 1859, which have shown that, whilst there is not an unvarying relation between the air inspired and the carbonic acid expired in ordinary respiration, but that the ratio increases with the severity of the exertion, there is such a correspondence that the one may be used as a measure of the other in ordinary inquiries, and especially that the measure of the air inspired may be used as a measure of the relative effects of similar agents.

The effects of the most laborious prison occupations, as the treadwheel, crank, and shot drill, over the respiratory function and over pulsation have

been determined by Dr. Smith, by experiments made upon himself in Coldbath-fields, Wandsworth, the New Bailey Salford, and Canterbury prisons. The experiments upon the quantity of air inspired were made by the aid of a spirometer, which was a dry gas-meter with an inverted action and enlarged apertures, and was connected with the body by a mask which enclosed the nose, mouth and chin, and prevented ingress and egress of air, except through pre-arranged valvular openings. This was bound upon the head with straps. The spirometer was adapted to register from 1 to one million cubic inches. The inquiry in reference to the carbonic acid was made by the aid of a double set of the apparatus elsewhere described*.

With Treadwheel Labour.—The effect of treadwheel labour varies in different prisons with the rapidity of the ascent, and other phenomena. Thus at the Coldbath-fields prison the amount of air inspired per minute during two minutes after having been upon the wheel five minutes, and again during two minutes after having been upon the wheel thirteen minutes, was, in various experiments, from five to six times the quantity expired at rest, viz. 2900, 2605, 2350, 2350, 2435, 2460, and 2450 cubic inches, giving an average of 2500 cubic inches per minute.

At the New Bailey, Salford, the average of experiments made upon two days gave only between three and four times the quantity at rest, viz., 1839 cubic inches per minute.

At the Canterbury gaol the amount was even less, and varied from 1607 to 1820 cubic inches per minute; but as the rate of ascent varied greatly at that treadwheel, it was impossible to obtain fair average results.

The rate of respiration at Coldbath-fields was about double that at rest, viz., 27, 26½, 25, 23½, 24½, 25, and 26 per minute. At the New Bailey it was 24 per minute; at Canterbury it was still less, and varied from 21½ to 24 per minute. The depth of inspiration at Coldbath-fields was from 3 to 4 times that at rest, viz., 107½, 91½, 94, 100, 99½, 98½, and 94½ cubic inches. The rate of pulsation at Coldbath-fields was more than double of that at rest, viz., 150, 172, and 168 per minute; at the New Bailey 159, and at Canterbury 140 to 158 per minute. That of the prisoners was at the New Bailey from 125 to 155 per minute; and at Canterbury, from 118 to 142 per minute.

Such was the effect of the labour during the period of exertion; but in order to determine the full influence it is necessary to refer to the intervening periods of rest also; and in doing so it will be found that, during the whole period of rest allowed, the functions were never restored to their normal action.

At Coldbath-fields, after thirteen minutes' rest, the quantity of air inspired was still nearly double of that at rest, viz., 980 and 815 cubic inches per minute; and at the New Bailey, after four minutes' rest, it was 855 cubic inches. The rate of respiration at Coldbath-fields was reduced to an addition of about $\frac{1}{4}$, viz., 18½, 15, and 16½ per minute, and at the New Bailey to 18 per minute.

The depth of respiration was nearly one-half greater than during normal rest, viz., 53, 48, and 49 cubic inches at Coldbath-fields.

The rate of pulsation at Coldbath-fields was one half more than the normal amount, 110, 97, and 120 per minute, whilst at the New Bailey it was reduced to 109 per minute.

These two sets of inquiries, when conjoined with the knowledge of the prescribed duration of each, enables us to compare the effect of these modes of punishment at the different gaols, notwithstanding the almost un-

* 'Health and Disease as influenced by the Daily Seasonal and other Cyclical Changes in the Human System.' By Edward Smith, M.D., F.R.S. Walton and Maberly.

accountable diversity which exists in the use of them; and the result will show, in a most striking manner, the great accuracy with which experience enables ordinary officials to regulate their system of punishment to the full powers of endurance of the prisoners.

It is customary at Coldbath-fields for the prisoners to work and rest during fifteen minutes alternately; but at the New Bailey they are placed upon the wheel during twelve minutes, and have only four minutes' rest before the labour is renewed. Hence, the actual period of labour at Coldbath-fields is only $3\frac{3}{4}$ hours, but at the New Bailey it is six hours daily; and although the labour is lighter at the New Bailey than at Coldbath-fields the total effect per day is the same in both prisons, as the following estimate proves:—

COLDBATH-FIELDS.

	Total daily. Cubic Inches.
3 $\frac{3}{4}$ hours' work with 2500 cubic inches of air inspired per minute	562,500
3 $\frac{3}{4}$, " rest with 1000 " "	225,000
	<u>787,500</u>

NEW BAILEY.

6 hours' work with 1850 cubic inches of air inspired per minute..	666,000
2 " rest with 950 " "	114,000
	<u>780,000</u>

Thus, with the use of instruments differing so greatly in power over the human system, the plan pursued in each gaol is so well adapted to the usual powers of the body, that the difference in the effect is only equal to about three minutes' actual labour upon the treadwheel at Coldbath-fields, and four minutes' at that at the New Bailey. This result illustrates also the accuracy of the method of inquiry thus adopted.

The influence of this kind of labour over the production of carbonic acid as well as over the rate of the functions, was established by another set of experiments made in a similar manner at Coldbath-fields prison.

The apparatus employed was that already mentioned, and was used without inconvenience when placed upon a shelf over the wheel and at a suitable distance from the person to be experimented upon. As there was necessarily some adverse weight placed upon the expiration by the collection of the carbonic acid, it was not thought advisable to measure the air inspired also, lest the result should be vitiated by placing some impediment upon both acts of respiration at a time when the deepest and most frequent inspirations were demanded; and hence that part of the inquiry was abandoned. The ascent of the body upon the wheel was 28·65 feet per minute, and the weight to be lifted was 200 lbs., and hence the labour actually performed was equal to lifting 575·558 tons through 1 foot per day. The duration of the labour was a quarter of an hour at a time, and the carbonic acid was collected during three minutes after having been upon the wheel five minutes, and during two minutes after ten or after thirteen minutes. Thus the carbonic acid was collected during five of each fifteen minutes. The quantity obtained per minute was between five and six times that expired in normal rest, viz., 43·36 grains, 42·9 grains, and 48·66 grains on different days, the latter quantity having been found soon after a good prison-dinner of soup. The average excretion of carbonic acid under the influence of treadwheel-labour was thus 45 grains per minute.

The rate of respiration was 22, 21, and 20, and that of pulsation 150 per minute on each of the occasions referred to.

The carbonic acid was also collected in the interval which followed the labour, viz., during three minutes after four minutes' rest, two minutes after ten minutes' rest, and two minutes after thirteen minutes' rest; and, on the average of the whole, the rate of excretion was above that at rest, viz., 9·14 grains per minute. The quantity of air inspired was also measured at the same periods, and was somewhat less than that which occurred in the previous experiments, viz., 680, 590 and 600 cubic inches, 560 and 540 cubic inches, and 560 and 570 cubic inches per minute. The rate of respiration was 17, 16 and 15, and the rate of pulsation at the end of the 15 minutes' rest, was 102 per minute.

Thus the results obtained from inquiries into the quantity of air inspired and of carbonic acid expired during treadwheel-labour closely correspond, and show that at Coldbath-fields the influence of that mode of punishment is to increase the elimination of respiratory products from five to six times during the period of actual labour.

With the Hard-labour Crank.—The next series of experiments refer to the influence of the crank as an instrument of punishment. This instrument is simply a hand-mill which demands a certain expenditure of force to move the handle, and is described as having a pressure of such a number of pounds as may be requisite to depress the handle from the horizontal to the vertical position. It is not used profitably, and is worked by each prisoner separately in his cell. Experiments have been made at Wandsworth and the New Bailey prisons in the manner already described.

At Wandsworth the cranks are Appold's patent, and are of superior construction. They move with a minimum pressure of 7 lbs., but the pressure required to move them may be increased to 10 or 12 lbs. by a prepared set of weights. The usual number of revolutions which the prisoner must make per day of ten hours, is 13,500; but that number may be reduced at the discretion of the Surgeon. The index is in sight of the prisoner, so that he may ascertain the progress of his work.

The experiments were made at several periods on two days with 7 lbs. and 12 lbs. pressure, and with varying rates of speed. The rate which was the most natural was forty revolutions per minute, but the prisoners generally performed about thirty per minute. The effect upon the system varied much, both with the pressure and the speed; but, excepting the rate of pulsation, the very interesting fact was deduced, that *the total effect of the day's work in performing the required number of revolutions was nearly the same, whether the rate was 30 or 45 per minute.* With 7 lbs. pressure and 30 revolutions per minute, the quantity of air inspired was somewhat less than double of that at rest, viz., 912½ cubic inches per minute, with 17 respirations and 92 pulsations per minute. With the speed increased to 45·7 revolutions per minute, the quantities of air inspired were increased to nearly three times that at rest, viz., 1336 cubic inches, with 21·5 respirations and 113 pulsations per minute.

With 12 lbs. pressure and 30 revolutions per minute, the quantity of air inspired was between 2 and 3 times that at rest, viz., 1260 cubic inches; the rate of respiration 24·7, and the rate of pulsation 111·5, per minute. Two experiments gave almost identically the same results, the only difference being 3 pulsations, ·4 respiration, and 3 cubic inches of air per minute. With the speed increased to 44·7 revolutions per minute, the average of two experiments gave 1898 cubic inches of air, or about 4 times that at rest, with 24·7 respirations and 150 pulsations per minute.

The effect of speed in reference to the day's work of 13,500 revolutions may be thus shown:—

1. With a pressure of 7 lbs. With 30 revolutions per minute 7 hours $33\frac{1}{3}$ minutes will be employed in completing the task, and the total quantity of air inspired will be 415,636 cubic inches ; but if the rate be 45·7 revolutions per minute, the task may be completed in 4 hours 55·4 minutes, and the total quantity of air inspired will be 345,654 cubic inches, giving a difference of 7982 cubic inches, or 'only 6 minutes' labour at the greater speed in favour of the increased speed.

2. With a pressure of 12 lbs. With 30 revolutions per minute the total quantity of air inspired will be 571,158 cubic inches, and with 44·7 revolutions per minute it will be 573,196 cubic inches per minute, quantities which for all purposes may be regarded as identical.

Hence the law is established that the effect upon the system of the whole day's work varies little with the speed, provided there be a fixed number of revolutions per day.

The experiments in reference to the effect of the two pressures with the same kind of crank, show that with the ordinary rate of revolution the influence of the 7 lbs. to the 12 lbs. is a little more than as 3 to 5, or in general terms it may be affirmed that $3\frac{1}{4}$ hours' labour with the 12 lbs. pressure is equal to 5 hours with 7 lbs. pressure. When the rate was increased beyond the ordinary one, the relative effect of the greater pressure was somewhat higher.

The cranks used at the New Bailey prison are much inferior to those found at Wandsworth, and the pressure employed cannot be rigorously determined. The medium amount of pressure was estimated at 7 lbs. ; and the effect of this labour with a rate of revolution of 36·5, 39·5, and 40 per minute was to cause the inspiration of nearly double of that of the 7 lbs. crank at Wandsworth, viz., 1793 cubic inches of air per minute, with $21\frac{1}{2}$ respirations and 155 pulsations per minute. When the pressure was increased to the one of nominally 9 lbs., the quantities were nearly 75 per cent. higher than that of the 12 lbs. crank at Wandsworth, viz., 2105 cubic inches of air, with $23\frac{1}{2}$ respirations per minute. Hence the effect was much greater at this than at the Wandsworth prison, and the pressure, although nominally the same, was fearfully different.

Such is the effect of crank-labour, an effect which time for time is less than that of the treadwheel ; but the experience in prisons proves that crank-labour is not inferior in severity to that of the treadwheel, and, in the observation of many, has long been believed to exceed it. The inquiries now recorded enable us to determine this question with exactitude, and to show that, when the duration of the labour is taken into consideration, the effect of the crank at the New Bailey is so great that the treadwheel may be used as a relief from it.

In comparing the effect of crank- and treadwheel-labour, it has been shown that the 12 lbs. crank at Wandsworth and the so-called 7 lbs. crank at the New Bailey, are equal time for time to that of the treadwheel at the New Bailey, but that the effect of the so-called 9 lbs. crank at the New Bailey is nearly equal to that of the treadwheel at Coldbath-fields, when considered time for time ; but as the time of actual daily labour with the crank is double that of the actual labour on the treadwheel, the whole daily effect must be so striking as double of that of the treadwheel. Can it be wondered at that the punishment of the lash and of the dark cell for neglect of work is frequent at the New Bailey, and in general in all prisons where the ordinary punishments are very severe ?

With the Shot-drill.—This punishment is common in military prisons, but in civil prisons it is used unfrequently and rather as an exercise and an alle-

viation from more severe labour. The labour varies with the weight of the shot to be carried, the weight of the body, and the rate of speed. The weight of the shot is known and regulated, but varies in different prisons, whilst the speed is dependent upon the will of the presiding officer. With a 16 lbs. shot at Coldbath-fields, the average of three inquiries showed that the quantity of air inspired amounted to nearly 4 times the amount at rest, viz., 1800 cubic inches per minute; and the rate of pulsation was 146 per minute; but with the 24 lbs. shot the quantities increased to 1850 cubic inches, and 154 pulsations per minute. The increase in the quantity of air inspired corresponded with that observed by Dr. Smith when carrying various weights at the "quiet march," viz., an increase of 7 cubic inches for each lb. of weight. The 32 lbs. shot is commonly employed in military prisons, but no experiments have been made with it. The chief sense of suffering in this labour is found in the arms and back, from the frequent stooping and lifting which are required, and therefore it is evident that persons of different height and bulk will be influenced variously.

EMISSION OF NITROGEN.

The next series of inquiries to which reference will be made, are those which show the influence of prison discipline over the excretion of nitrogen, and which constitute the most laborious and extended portion of these researches. They consist of two sets, one of which was prosecuted at Coldbath-fields under the immediate supervision of Dr. Smith, and the other at Wakefield under that of Mr. Milner. The same series were also employed to determine the relation of the ingested and egested nitrogen; but this part of the inquiry will, as has been already mentioned, be reserved for the second part of this report.

EXPERIMENTS AT COLDBATH-FIELDS PRISON*.

In the first set of inquiries four prisoners in Coldbath-fields prison were selected who had been some time in prison, and who worked the treadwheel on three days in each week. Their ages varied from 22 to 43 years, their height from 5 feet $2\frac{1}{4}$ inches to 5 feet 7 inches, and their weight from 105.1 lbs. to 122.6 lbs., and the averages were 32 years, 5 feet $4\frac{1}{4}$ inches, and 113.75 lbs. They were spare but in good health, and their habits of body were tolerably regular. By the kindness of the Visiting Justices and the governor of the prison, Mr. Lambert, the third officer, took these men under his immediate charge, and collected the urine, weighed the faeces, weighed the food and the body, superintended the meals, the period of exertion, and the whole general arrangements of the inquiry. The inquiry occupied 26 days. The dietary was uniform, with the exceptions to be presently mentioned, and consisted of 20 ozs. of brown bread, 1 pint of cocoa, 1 pint of gruel, $4\frac{1}{2}$ ozs. of lean and $1\frac{1}{2}$ oz. of fat cooked meat, 8 ozs. of boiled potatoes, 1 oz. (reduced to $\frac{3}{4}$ oz.) of salt, and 30 ozs. of water; and one of the men had $6\frac{2}{3}$ ozs. of extra bread per day. The average quantity of solid food was 34 oz., and of fluid 70 ozs., daily, besides the ingredients of the gruel and cocoa, and the extra bread of one of the prisoners. The exceptions made in the dietary were as follows:—No salt, except that in the cooked food, was allowed during four days; and $3\frac{1}{2}$ ozs. of extra fat, $\frac{1}{2}$ oz. of tea, $1\frac{1}{2}$ oz. of coffee, and 2 ozs. of alcohol, were separately given through succeeding periods of three days each.

* For further details than are included in this Report, see 'Philosophical Transactions,' 1861.

The discipline enforced consisted of treadwheel-labour on three days weekly, from $7\frac{1}{4}$ A.M. to $5\frac{1}{2}$ P.M., comprehending a period of $3\frac{1}{2}$ hours of actual labour, and an actual ascent of 1.432 mile, and was equal to lifting 384 tons through 1 foot daily. On the alternate days the labour was oakum-picking, or similar light occupation, and on Sunday there was perfect rest.

The urine was collected in bottles which were used also whilst passing faeces. Two collections only were made on Sundays, viz., those of the day and night, but on the weekdays the urine was also collected separately, from 6.15 to 7.15 A.M.; and on the treadwheel-days from 7.15 to 8.25, A.M. These two latter sets of quantities were termed "basal quantities," since by one it was hoped to determine the actual rate of urinary excretion in the absence of food, and by the other the influence of treadwheel labour apart from any other influence. The analyses for urea and chloride of sodium were made by Dr. Smith; but those of the food and faeces, and the final analyses of the urine were kindly made by Mr. Manning. The samples for analysis were taken with the utmost care. The details of this investigation are very numerous; and probably it may suffice to give the following principal results of the inquiry.

Urea.—The proportion of urea to each lb. of body-weight, both on days of labour and on those of rest, was much above that found in the ordinary conditions of life, viz., from 4.39 grains to 4.74 grains, or an average of 4.58 grains to each lb. of body-weight. It was less than 4 grains to each lb. on only one occasion in each of the lighter, and on three occasions in each of the two heavier men, whilst Dr. Smith found in himself with about the same food, but with much greater weight of body, an average proportion of only 2.75 grains to each lb. The cause as well as the significance of this fact is not clear; for, as it occurs with rest as well as labour, it can scarcely be an evidence of increased degradation of tissue, and as the food allowed is not much beyond that which a man in health would ordinarily eat, it cannot be the result of an undue ingestion of nitrogenous food. The probable explanation is that already referred to, viz., that the nitrogenous tissues in the bodies of prisoners after a certain term of imprisonment, bear a larger proportion to the weight of the whole body than is found in health under ordinary conditions, since, by the labour and discipline of the jail, they have lost much of their fat and the fluid contained in the tissues is reduced to a minimum quantity. The average weight of these men was much below the ordinary weight of men of their age and height. If this be the true explanation, the relation of urea to body-weight loses much of its physiological importance.

The urea excreted during treadwheel-labour before breakfast showed that such exertion had no definite influence over the elimination of that product. In one of the cases the excretion of urea was much greater than in the others. There was some diversity in the quantities evolved by the others; so that in one they were the same in labour as at rest, in another there was an excess of 2.5 grains per hour with rest, and in the 3rd there was an increase of 1.9 grain per hour with labour; but on the average, of all the three over the whole period, there was .2 grain per hour less evolved with labour than during rest; and on the average of all the four prisoners, this defect was so much as 2.4 grains per hour. There were numerous occasions on which there was an excess with labour, viz. 28, 33, and 71 per cent. of the observation in the three cases above separated. The greatest excess with labour was 7.5 grains, and the greatest defect with labour was 5.3 grains per hour, and both occurred in the same person.

As this inquiry occupied only 80 minutes at one time, it is very probable that

the urea produced would not be eliminated within that period, and hence we cannot take this as indisputable evidence of the effect of treadwheel-labour. The variations above referred to were also, in part at least, due to the variation in the quantity of urinary water which was secreted during that period ; and it is just possible that, notwithstanding every care, the bladder might not have been completely emptied on each occasion.

The total daily excretion of urea was the least on the Sunday, greater on the days of light labour, and the greatest on days of treadwheel-labour, on which occasions the average quantities were 49*t*, 512, and 528 grains, giving a daily increase on treadwheel-days of 16 grains over that of days of light labour, and of 34 grains over that of perfect rest. There were some diversities in the results, owing, apparently, to the fact that on two occasions the elimination of the urea due to the treadwheel-days was in part deferred until the next day, when there were remarkable meteorological disturbances, and thus gave the appearance of greater elimination on the days of light or of no labour. From this cause one of the cases gave an average decrease of 51 grains of urea on the days of treadwheel-labour, but in the other three prisoners the increase with labour was 37, 59, and 21 grains daily. The largest increase on the treadwheel-days was 144 grains, and the largest decrease 100 grains per day.

Urinary Water.—The quantity of urinary water evolved was, on the total average, 10·4 per cent. greater on treadwheel than on other days, viz., 74·7 and 67·7 fl. ozs., and the same relation held good in each of the cases. Thus

Register No. of Prisoner.	On Treadwheel days.		On other days.	
	ozs.	ozs.	ozs.	ozs.
858	79·4		73·15	
948	82·87		70·8	
1040	67·9		63·8	
1041	68·9		62·9	

The quantity of fluid drank was the same on each day, and the amount lost by perspiration was much greater on treadwheel-days than on other days ; and hence the blood and tissues must have lost considerably more fluid with great labour than occurs with rest.

Chloride of Sodium.—The evolution of chloride of sodium was very great, owing to the large quantity taken with food, but was somewhat less on treadwheel days than on other days, viz., 509 and 520 grains. When the quantity of chloride of sodium taken with the food was diminished, the same relation was still maintained, but in a less degree, viz., 432 and 437 grains. There was much variation in the results.

Hence, from all these inquiries, it follows that there is an increased elimination of urea and urinary water with treadwheel-labour, but the former is much less and the latter much more than we should have expected. Neither of them are efficient measures of the true effect of exertion.

Fæces.—The determination of the daily evacuation of fæces was rendered difficult from the habit of one of the prisoners to have an evacuation only on alternate days, and the only method by which we could make an approximation to the daily evacuation was to divide the quantity on alternate days into two equal parts, and reckon one part on the day on which no evacuation occurred. The fæces were also placed under the date of the preceding day, as they clearly were due to the conditions of that day. The following are the principal facts deduced :—

1. The average weight of the fæces daily was double of that found in

ordinary life, and varied on the average of the different prisoners, from 7·1 to 10·1 ozs., and gave so large a total average as 8·55 ozs. The extremes of single observations were 1·75 and 26·59 ozs. The proportion to the solid food was 22½ per cent.

2. The weight was increased on Sunday by 44·3, 70, and 74 per cent. of that on all days.

3. The weight was lessened on the treadwheel-days from that observed on Sundays, by 41, 53·3, and 42·6 per cent. in three cases, and from the average of all days by 14·8 and 21·1 in two cases, whilst in the 3rd case the weight was equal on all days.

4. The least evacuation occurred on the Saturday (which was also a treadwheel-day), and the diminution from the weight of all days was 26·1, 57·6, and 34·6 per cent., and from that on Sundays no less than 48, 75, and 62 per cent.

5. The proportion of water contained in the faeces was very uniform from day to day, viz., 73·5 per cent., and varied only from 71·8 to 77·6 per cent. on different days. It was above the average on Sundays and a little below the average on treadwheel-days.

6. The quantity of nitrogen in each oz. of fresh faeces varied from 4·36 to 4·9 grains, and was, on the average, 4·646 grains. The total daily quantity thus evacuated, was, on the average, no less than 41·8 grains. There was a considerable increase on the Sunday, and a marked decrease on the Saturday, and it was below the average on treadwheel-days, and in both of these respects it corresponded with the gross weight of the faeces. The actual amounts under the three conditions were 59·9, 35·8, and 40·53 grains, giving an increase of 43·3 per cent. and a decrease of 14·3 and 3 per cent. There was a very interesting fact noticed in reference to the relation of nitrogen in the urine and faeces on the Sunday, and which showed, probably, that the assimilation of food was lessened on a day of perfect rest following one of hard labour, viz., that the increase which was observed in the nitrogen in the faeces on the Sunday corresponded accurately with the decrease observed in the urine on that day, viz., a decrease of 13 and 18 grains of urea in the urine, and an increase of nitrogen, reckoned as urea, in the faeces, of 71·33 grains.

7. The case which had the extra allowance of 6 $\frac{2}{3}$ ozs. of bread daily, evacuated the largest amount of faeces, both on the total average and on Sundays,—a fact of great significance in reference to the kind of food which should be selected for extra diets.

Summary.—Thus, on reconsidering the foregoing results obtained from this large series of inquiries, the following general facts were elicited:—

The prisoners emitted much more urea and faeces than occurs in ordinary life.

On Sundays, with entire rest, the amount of urea was commonly lessened, but the nitrogen in the faeces was increased in the same degree. The whole weight of the faeces was increased.

With treadwheel-labour there was a small increase in the amount of urea and of urine evolved, whilst there was a small decrease in the evolution of chloride of sodium in the urine, in the weight of the faeces, and the nitrogen and the fluid contained in the faeces.

On Saturdays, with treadwheel-labour, the diminution in the weight and nitrogenous matter of the faeces was considerable.

With increase in the allowance of bread to a prisoner who was believed to need extra diet, there was a considerable increase in the weight of the faeces and loss of their nitrogen, and particularly with rest.

Experiments with Fat, Tea, Coffee, and Alcohol.—The foregoing observations will be again referred to at the end of the report, and will form a basis upon which the Committee may offer some recommendations; and before closing the analysis of this inquiry the Committee propose to state the results of certain short experiments which were made upon the effect of fat, tea, coffee, and alcohol when temporarily added to the dietary. It is not proposed on this occasion to enter into detail, since the results obtained point to the desirability of conducting similar inquiries through much longer periods.

The issue of the inquiries was as follows:—

1. During the period of the administration of $3\frac{1}{2}$ ozs. of extra fat daily, the amounts of urea and urinary water excreted were 529 grains, and 69.17 ozs. on the average of all the cases, showing that no noticeable change had been produced.

2. During the withdrawal of $\frac{3}{4}$ of an ounce (328 grains) of chloride of sodium daily, the quantity of that salt excreted by the urine was reduced from 506 to 184 grains daily, the difference being almost exactly the amount which had been withheld. After the full supply was renewed, it was some days before the whole again appeared in the urine.

3. The excretion of urea was lessened during the administration of the tea to 402 grains on the second, and 508 grains on the third, which was a treadwheel-day. The exact amount of the diminution cannot be determined, since in the three preceding days two treadwheel-days were included, and thus this basis of comparison was unduly elevated.

The excretion of chloride of sodium was increased to 542 grains per day.

The quantity of urinary water evolved remained unchanged.

4. The urea, which had fallen during the action of tea, remained below the average during the action of coffee (which was administered after the experiments on tea), but it rose 42 grains daily, and at the end of the period was scarcely below the quantity normally evolved. The quantity of chloride of sodium evolved was 50 grains daily less than with the tea, viz., 494 grains.

The quantity of urinary water was not changed.

5. The urea was also lessened during the action of alcohol, to the extent of 26 grains per day below the normal quantity; but it was still 14 grains per day higher than the quantity to which it first fell with the tea. The effect was much more evident with treadwheel-labour on the first day; for, instead of an increase with labour, there was an elimination of 43 grains less than occurred on the previous day with rest, but on the third day the increase with labour was 111 grains over that evolved on the Sunday. On the first day the barometer fell greatly and tended to prevent the elimination of urea. The greatest effect was upon the elimination of urinary water, being a diminution of no less than 20 ounces per day on the average of the three days; and as there was an unusual thirst during the administration of the alcohol (without, however, any additional fluid food being allowed), it is easy to see in how great a degree alcohol tends to temporarily fix fluid in the tissues of the body, and in doing so to restrain the emission of urea. There was also a large diminution in the excretion of chloride of sodium, but it corresponded precisely with the diminution in the urinary water. The quantity evolved daily was 352 grains, or a diminution of 27.5 per cent.

Hence the effect of tea, coffee, and alcohol in lessening the emission of urea appeared to be temporary only, and in the case of alcohol was associated with retention of fluid in the body, and consequently with an increase of weight. The information thus obtained renders it important to test the influence of each article over a much longer period.

EXPERIMENTS AT THE WAKEFIELD PRISON. APPENDIX X.

In June 1861 another series of inquiries were prosecuted in Wakefield Goal of a character similar to those just related. Mr. Milner took charge of all the observations which were made within the prison; Dr. Smith made the analyses for urea and chloride of sodium; and Mr. Manning kindly determined the dry matter and the nitrogen in the food, faeces, and urine.

Four men of regular habits and in good state of health were selected. Two were weavers of coarse matting, which is a very laborious occupation, and two were tailors. Their ages were 19, 22, 24, and 28 years; their height was $64\frac{3}{4}$, 66, $66\frac{3}{4}$, and 67 inches; and their weight was 118 lbs. 11 ozs., 125 lbs. $12\frac{1}{2}$ ozs., 146 lbs. $11\frac{3}{4}$ ozs., and 146 lbs. $15\frac{3}{4}$ ozs. The girth around the nipples was $32\frac{3}{4}$ inches, $34\frac{1}{4}$ in., $35\frac{3}{4}$ in., and $35\frac{1}{4}$ in., giving an average of nearly $34\frac{1}{2}$ inches. The total averages of age, height, weight, and girth were $23\frac{1}{4}$ years, 66·1 inches, 134 lbs. $8\frac{3}{4}$ ozs., and $34\frac{1}{2}$ inches.

They had been fed on the highest class of prison dietary; but as that consisted of some variety of food, it was deemed advisable to give them a uniform daily diet during one week before the experiments began, and it was continued without intermission until the inquiry terminated.

The food supplied daily was in part fixed, and in other part variable in quantity. The fixed quantities were those of meat, oatmeal, and potato, and the variable ones those of bread, salt, and water. Milk was given in a fixed quantity, but the amount supplied was not uniform in both classes of prisoners.

The meat consisted of 5 ozs. of lean and 1 oz. of fat cooked beef, without bone. The supply of oatmeal was 2 ozs., and 16 ozs. of cooked potato; 20 ozs. of skimmed milk were given to the tailors, and 25 ozs. to the weavers. The daily quantity of bread eaten was on the average 30·4 ozs. by the tailors, and 34·3 ozs. by the weavers, or a general total of 27·35 ozs. 136·5 grs. of chloride of sodium were eaten (besides that contained in the bread) by the tailors, and 63·5 grs. by the weavers, giving an average of 100 grs.; but there was some considerable variation from day to day. One of the tailors ate an average quantity of 199·3 grs.; whilst the other tailor ate only 73·8 grs.

The quantity of water which was drunk, besides that contained in 1 pint of gruel, was only 23·8 ozs. on the average, giving with the milk a total supply of fluid of 66·3 ozs. The weavers drank much more than the tailors, and the total daily quantities in the two classes was 80·5 ozs. and 52·1 ozs. The solid food was 51·8 ozs., and the fluid 66·3 ozs., or a total of 118 ounces daily.

The men arose at 6 A.M., and having passed urine and faeces were immediately weighed. The scales employed were good ones, and the weight was taken to $\frac{1}{4}$ th of an ounce. The prisoners were weighed naked. The weight of the faeces and urine was ascertained daily, by the aid of balances kindly lent by Messrs. Avery, of Birmingham, up to $6\frac{1}{2}$ A.M.; and the degree of consistency of the faeces was recorded under five heads, viz. scybalous, well-formed, formed but soon subsiding, soft, and liquid. A fair sample of the bread, oatmeal, potato, meat, and milk was sent up to Mr. Manning from time to time as changes in the supply occurred. A portion of the mixed quantities of faeces and the urine of each set of prisoners was most carefully taken and sent for analysis daily; but delay sometimes occurred in the transmission, so that the analyses were usually made on the third day after the evacuation. The greatest care was taken to avoid loss by evaporation and otherwise, and to prevent decomposition. The observations included thirteen days besides the week of preliminary dietary, and the following are the principal results which have been obtained:—

Weight of body.—The average weight of three of the prisoners during the inquiry was greater than that recorded on the day preceding the commencement of the inquiry, but there was a loss of weight in the fourth. The average gain was, in the tailors, $15\frac{1}{2}$ ozs. and $17\frac{3}{4}$ ozs., and in one of the weavers $3\frac{1}{4}$ ozs., but in the other weaver there was a loss of $3\frac{3}{4}$ ozs. The greatest gain in the different cases was 1 lb. $13\frac{1}{4}$ ozs. and 1 lb. $7\frac{1}{2}$ ozs. in the tailors, and $8\frac{3}{4}$ ozs. and 1 lb. 11 ozs. in the weavers; and the greatest loss $1\frac{1}{4}$ oz. in one tailor, 1 lb. $2\frac{1}{4}$ ozs. and $4\frac{1}{2}$ ozs. in the weavers. There was not an unvarying progression in the weight during the week, but in every case there was an increase from the Saturday to the Sunday, and the amounts were as follows:— $11\frac{1}{4}$ ozs. and $10\frac{1}{4}$ ozs., $9\frac{1}{2}$ ozs. and 5 ozs. in the tailors; $6\frac{1}{4}$ ozs. and $18\frac{1}{4}$ ozs., $19\frac{1}{4}$ ozs. and $31\frac{1}{2}$ ozs. in the weavers; or an average increase of 13.62 ozs. on the Sunday.

Urine: quantity.—The largest quantities which were evolved in one day were 25,321 grs. (56.6 ozs.) and 26,624 grs. (59.17 ozs.) in the tailors, and 27,791 grs. (62.3 ozs.) and 32,924 grs. (74 ozs.) in the weavers. The average daily quantity was 41.2 ozs. in the tailors, and 47.51 ozs. in the weavers, giving a total daily average of 44.35 ozs. There was a large increase on the Saturday, and a marked decrease on the Sunday, as the following figures prove:—

	Friday. ozs.	Saturday. ozs.	Sunday. ozs.
Two tailors	—	49.1	39.45
" "	37.85	48.25	37.9
Two weavers	—	51.92	44.98
" "	49.5	57.25	43.

The average decrease from the Saturday to the Sunday was 10.29 ozs.

Specific gravity.—The specific gravity of the urine varied from 1016 to 1027.5, but there was singular uniformity in the general results. In the tailors it was 1023.7 and 1025, and in the weavers 1024.37 and 1024.6, giving a total average of 1024.35 in the tailors, and 1024.45 in the weavers.

Urea.—The analysis for urea was made by Liebig's method, from a test solution which had been prepared in large quantity and used daily in other experiments. The chloride of sodium was not removed, but its amount was duly determined and deducted.

The total average daily quantity of urea evolved was 655.65 grs., of which 608.4 grs. were emitted by the tailors, and 702.9 grs. by the weavers; the maximum and minimum amounts were 790 and 456 grs., the former in the weavers, and the latter in the tailors. In the weavers the quantity exceeded 700 grs. in 7 of 13 days, whilst this occurred only 3 times in the tailors, and in only one instance during the inquiry was it below 500 grs. daily.

The quantity of urea to each pound of body-weight was 4.812 grs. in the tailors, and 4.675 grs. in the weavers; but it varied in the former from 3.72 to 5.82 grs., and in the latter from 3.62 to 5.39 grs. on different days.

The quantity of urea was always lessened on the Sunday. In the tailors the diminution from the Saturday to the Sunday was 145 grs. and 122 grs., and in the weavers 26 and 92 grs., giving a total average diminution of 96.25 grs.

The quantity in each ounce of urine was, on the average, 14.9 grs. in the tailors, and 15.25 grs. in the weavers, giving a total average of 15.075 grs. The maximum and minimum quantities were 18.8 and 12.3 in the tailors, and 17.84 and 13.53 in the weavers.

Chloride of Sodium.—The average quantity of chloride of sodium evolved

was 3·37 grs. per oz. in the tailors, and 3·18 grs. per oz. in the weavers, giving a daily emission of 138·844 grs. in the former, and 148·5 grs. in the latter.

Fæces.—The general character of the fæces was homogeneous and moderately cohesive, but on a few occasions there was a variety in the consistence. In the 52 observations 32 exhibited fæces formed but soon subsiding, 7 well formed, 1 scybalous, 2 soft, and 9 of mixed character, and no one person offered any marked difference in these characters. The bran of the brown bread was easily seen in the fæces. The average daily evacuation was 6·98 ozs. in the tailors, and 8·52 ozs. in the weavers, giving a total daily average of 7·75 ozs. There were somewhat considerable daily variations, so that the maximum and minimum quantities were, in the tailors regarded separately, 11·41 ozs. and 4·32 ozs., and in the weavers 14·42 ozs. and 1·72 oz., but in no instance was there the omission of a daily evacuation.

The quantity of nitrogen per cent. found by Mr. Manning by the volumetric method varied from .71 gr. to 1·16 gr. in the tailors, and from .97 gr. to 1·35 gr. in the weavers; but the total average in the two classes was .93 in the tailors, and 1·12 in the weavers, giving 1·025 gr. in the whole.

The total daily elimination of nitrogen by the fæces was found to be 27·43 grs. in the tailors, and 40·93 grs. in the weavers. The variation in the amount of fæces on Sunday from that of other days was not uniform, since it was less in the weavers and was equal in the tailors.

It will have been observed that there were many differences in the results obtained from the prisoners occupied in the two kinds of labour; and as one of the objects had in view was to show these differences, the two trades were selected which, in that prison, offered the greatest dissimilarity in the amount of exertion required.

Of these two sets of prisoners, the weavers of cocoa matting, when compared with the tailors, were older, taller, heavier, and broader; they ate more bread, milk, and water. They lost weight, whilst the tailors gained weight. They emitted more urine, urea, chloride of sodium, and fæces with their contained nitrogen; they exhibited much less diminution of urea on the Sunday, and a little less urea to body-weight.

It is not possible to compare the results of this inquiry very closely with those already described at Coldbath-fields, since in the latter inquiry the quantity of bread and water was rigidly fixed, whilst in the former there were daily variations. The quantity of bread taken was greater at Wakefield than at Coldbath-fields, and would so far increase the amount of urea produced, whilst the variable quantity of water taken from day to day would vary the elimination of that product. Yet these causes of variation are not of great value, and upon the whole it will be seen that there is a very close correspondence between the products of the weavers at Wakefield and those who worked the treadwheel at Coldbath-fields.

The weight of the men at Wakefield was more than that at Coldbath-fields, the quantity of urine and of fluid drank was less, and that of urea was greater, but the proportion of urea to body-weight was very nearly the same. In both there was more urea with labour, and less on Sunday. There was less chloride of sodium in the urine as there was less supplied in the food. The weight of the fæces and the contained nitrogen were the same in both places.

Conclusion.—The Committee cannot close this first part of their report without offering a few remarks in the nature of deductions or suggestions, but, inasmuch as the duty confided to them is limited to a consideration of the influence of prison discipline over the bodily functions of the prisoners, and the present is only a part of their report, they feel that they cannot express their views at any length.

The Committee venture to think that the time is approaching when the whole subject of prison discipline must be reconsidered, and when a determination may be arrived at as to the propriety of continuing a system which when practised occasions vast waste of the vital powers of the prisoners, and vast expenditure of money to provide a dietary which, although scarcely sufficient, is far beyond that provided for the poor in workhouses, and beyond that obtained by the working classes in general. The different systems adopted in prisons are furnishing some evidence as to the relative value of three plans,—viz., 1st, waste of animal force by the treadwheel and the crank; 2nd, the use of manufacturing operations; and 3rd, the effect of simple detention and instruction without labour; and these, when conjoined with the intelligent efforts put forth in the sister island, may almost suffice to guide those to whom its consideration may be intrusted.

It is, however, certain that if much bodily labour be enforced, whether in a profitable or unprofitable manner, there must be an expensive dietary to supply the reparative material; and no plan can be so wasteful as that which enforces profitless labour, and supplies an expensive diet to meet its demands.

The Committee also think that some steps should be taken to ensure uniformity in prison discipline throughout the kingdom; so that not only should great care be exercised (as at present) to apportion the sentence to the crime, but also that wherever the sentence is pronounced the carrying-out of it shall be also proportioned to the crime. This may be effected in the dietary, and yet allow such a variety of food as may be found relatively economical in different parts of the kingdom; for the nutritive value of various kinds of food is now tolerably known, and the quantity of each to give the same nutriment may be estimated. So also in reference to punishments. It is quite possible that the instruments should be of uniform construction, that by supervision they should be kept in uniform order, that the speed at which they are worked should be uniform, and the amount of a day's work should be universally the same, subject only to the opinion of the Surgeon as to the fitness of any individual to perform the required task. A committee of scientific men would find no difficulty in placing all this upon a satisfactory basis, if they were only authorized by the Government to do so.

It is also easy to estimate the amount of labour required in ordinary manufactures, at least so far to keep within the bodily powers of the prisoners; for we have the advantage of common experience as to the effect of such labour in ordinary life. But the Committee are of opinion that, when all the above-mentioned care shall have been taken, the effect of the proper prison punishments, as the treadwheel, crank, and shot-drill, upon the prisoners will still be very unequal, since it varies greatly with such natural conditions as the height, weight, age, and previous occupation of the person. Hence these punishments must be at all times objectionable.

The Committee defer until another occasion their recommendations in reference to the exact adaptation of labour to supply of food; but they take this opportunity of stating that, as it involves the fundamental question of the propriety of making the dietary an instrument of punishment, it will be necessary *in limine* to decide the latter question. When Sir James Graham appointed the Commissioners to draw up the present scheme of dietary, he expressly directed that the dietary should not be used as an instrument of punishment; but the Committee venture to affirm that the food supplied in the lowest scale is so totally unequal to the wants of the system, that it can only be regarded as an instrument of punishment; and that it is so regarded both by criminals and magistrates may be inferred from the dislike which

old offenders have to short imprisonment with its low dietary, and from the value which magistrates attach to this their most formidable agent.

Without expressing a strong opinion upon this point, the Committee venture to assert that a dietary of bread and water, or bread and gruel, cannot be enforced without doing serious injury to the prisoner's health; and that this is fundamentally recognized may be inferred from the fact that all agree that a high scale of dietary is absolutely demanded in long imprisonments. The Committee assert that the injury is one of degree, and that the shortness of the imprisonment prevents the ill effects being observed, which with a long imprisoninent have been proved to increase the mortality in gaols.

The Committee hope that, on philanthropic grounds, the principle may be established in prison discipline, that the prisoner shall not be so treated that when he leaves the gaol he shall be less able to earn his living than he was when he entered it, and that, punishment and reformation being sought together, some plan may be adopted which shall accord with that principle.

The fundamental fact of the duty of apportioning food to the labour performed needs to be re-established. At present the attempt is nugatory; but the Committee venture to hope that the principle will meet with universal concurrence, and that their labours afford at least some of the means whereby the estimation may be made.

The great value of the system of extra dietary cannot be too highly estimated; but the very admission implies that there is a defective adaptation of the general scheme of dietary to the wants of the system, and that almost the life of the prisoner is, throughout a large part of the imprisonment, at the discretion or negligence of one officer, viz. the Surgeon.

The Committee also venture to affirm that bread is far inferior to milk as an article of extra diet, as the experiments detailed in this report prove. The detention in prisons certainly lessens the power of assimilating food; and hence it is quite possible that whilst a given quantity of food would sustain a man out of gaol, it would not sustain him with the same labour in gaol. The object of extra diet is not so much to give additional material, as to give the kind of food which will aid the system in making a better use of that ordinarily supplied. Extra diet of bread (when the dietary is the highest scale) is in great part wasted, and increases disproportionately the amount of waste passing off by the bowel.

In conclusion, the Committee urge the great importance of making better use than heretofore of the unparalleled opportunities which prisons afford of working out the most important and difficult questions in nutrition, with a view to supply information for the more just and economical management of gaols, and for the advance of a science which is so essentially connected with the daily life of the community. Such questions are, the true value of white bread over brown bread in prison and other dietary; the exact influence of various kind of food, and especially of such as tea, coffee, milk and alcohol, which act chiefly by modifying the action of other food; the exact relation of a given quantity of food to a given amount of labour; the causes of the defective power of assimilation of food in prisons, and the relation of the elements of the food taken to those which are fixed in and thrown out of the body. The Committee feel that the importance of such inquiries is not by any means so well understood as it should be, and that some officials have a natural repugnance to anything which may interfere with their ordinary routine; but they trust that the expression of the opinion of this great Association, and the additional knowledge which they and others have endeavoured to discover, may open prisons to such inquiries.

The Committee will cheerfully undertake to lend their aid in further elucidating these matters, if it should be the pleasure of the Association to reappoint them; but they very respectfully represent the urgent necessity which exists for the appointment, by the authority of Government, of one or more Commissioners to reconsider the subject of dietaries, and to recommend plans whereby uniformity in the nature and action of the instruments used in prison punishments may be effected throughout the kingdom.

APPENDIX I.

On the Inequalities in the Dietary of County Prisons; being an Analysis of the "Return of Dietaries for Convicts," &c., issued in 1857.*

Forty-three only of eighty-seven county prisons have adopted the scheme of dietary recommended by the Government; and in reference to the forty-four prisons which dissent from that scheme, it will be evident, from the following statement, that much of the inequalities in their various dietaries is attributable to the defects of the Government scheme, much to mere caprice, something to very defective knowledge as to the requirements of the human system, and something more to the absence of a desire to avoid injury to the prisoner. We shall first give in a few words the dietary of the Government scheme, and then describe the dietaries of all the prisons which have striking peculiarities.

There are five classes of dietaries recommended by the Government, according to the duration of the sentence, and such that the quantity and quality of food are increased from the beginning of the imprisonment as the duration of the sentence is increased.

Up to twenty-one days, only bread and gruel are given, but under seven days the bread (1 lb.) is given at dinner only, whilst over that period twenty-four ounces are distributed over the three meals. Under seven days, females receive as much bread for dinner as the males; but over that period they receive but half the quantity.

From twenty-one to forty-two days with hard labour, and to four months without hard labour, three ounces of cooked meat with bread and potatoes are given for dinner twice per week, one pint of soup (containing the same quantity of meat) with bread twice, and simply bread and potatoes thrice per week.

From forty-two days to four months with hard labour, and beyond four months without labour, three ounces of meat is given daily in soup or otherwise.

Beyond four months with hard labour, the quantity of meat is increased four times per week to four ounces, and an increase of half a pound of potatoes is added,—soup, potatoes, and bread being supplied on the other days. Sweetened cocoao for breakfast is also given thrice per week.

The erroneous principles upon which this scheme is founded are, the apportionment of food according to duration of sentence, the insufficiency for short sentences and for hard labour, and the variation from day to day; but

* It is probable that some changes have been made in the dietaries of some of the County Gaols, and particularly in those marked with an asterisk (*), since the return of 1857 was issued, and since the following analysis was made; but of this there is no authorized information. The analysis will, at least, show the state of the dietaries when the return was issued.

having already pointed them out in a paper published in the Transactions of the Society for the Promotion of Social Science, we shall not pursue that subject on this occasion, but at once proceed to consider the dietaries opposed to this scheme.

The Welsh gaols, as a whole, have a reduced scale of dietary ; but one of them, viz. the Cardiff Gaol*, is the most remarkable in the deficiency ; whilst another, the Brecon Gaol, is nearly equally remarkable for its plenty. It is instructive to notice how widely the schemes differ under different administrations, whilst the condition of the inhabitants of the localities must be much the same. In the Cardiff Gaol there are four classes of prisoners, the highest including all those condemned for periods exceeding fourteen days, a term scarcely equal to the second class of the government dietary, and even in that no meat or other animal food in any form is given. For breakfast and supper there is half a pound of bread and two ounces of oatmeal made into gruel, whilst at dinner there is only half a pound of bread and one pound of potatoes. But if the prisoner should be condemned to hard labour he will receive one pint and a half of soup, made from two ounces of Scotch barley and two ounces of rice, and it is the same whether he is condemned to hard labour for fifteen days or fifteen months ! If the prisoner is condemned for more than seven and less than fourteen days, he receives for dinner half a pound of bread only. If not exceeding three days or seven days, the breakfast and supper consist of half a pound of bread only, whilst the dinner is composed of half a pound of bread, and in the latter case of one pound of potatoes in addition. Thus, if he be confined for three days or for fourteen days, half a pound of bread only is sufficient for the dinner ; but, if it be for seven days, he is supposed to need one pound of potatoes in addition ! This is the worst dietary in the whole of the county gaols ; but the dietary of the Derby Gaol* shows that Englishmen as well as Welshmen are sometimes fed with the almost entire absence of animal food. The Derby dietary is divided into three classes ; but we are not favoured with the grounds of this division. In the first class there are six ounces of bread and one pint of porridge for breakfast, whilst in the second and third classes the quantities are increased to eight ounces and one pint and a half. The word *porridge* does not imply that excellent article which we remember to have enjoyed in boyhood, but it consists of a quarter of a pint of milk and three-quarters of a pint of water, and one ounce and a half of oatmeal, instead of two ounces ordered by the Government to each pint of gruel. The supper consists of four ounces of bread and one pint of gruel (we are not informed as to the ingredients of the gruel) for the first class, six ounces of bread and one pint of porridge for the second, and eight ounces of bread and one pint of porridge for the third. The dinner in the first class is ten ounces of bread only ; in the second class there are eight ounces of bread and one pound of potatoes five times per week, and eight ounces of bread and one pint of soup twice per week (the excellence of the soup is not stated) ; in the third class eight ounces of bread and two pounds of potatoes ! twelve ounces of bread and one pint of soup thrice, and twelve ounces of bread and four ounces of meat once per week. The points of greatest interest are the excessive amount of farinaceous food, and the great defect of animal food. There is also a note appended to this return, stating that cases do *sometimes* occur of prisoners losing weight ! If in the Wakefield Prison, to which we shall refer presently, a very large number of the prisoners lose weight under the best management, and with a much better dietary, it is not wonderful that at Derby they should lose weight *sometimes*. We should be glad to know if they are weighed accurately and periodically ; if they enter the prison having an average weight ; what percentage in each

class lose weight during their imprisonment; and what is the tone of their muscular system on discharge? The note also states that when they lose weight the surgeon orders them to have extra milk, or bread, or meat. But essential articles of diet should not be left to the chance of the negligence or indiscretion of even the best of men.

The Breeon Gaol offers a contrast to both of the foregoing. Thus, for periods exceeding fourteen days, the prisoner receives six ounces of meat with eight ounces of bread on four days in the week, and also half a pound of potatoes if under, and one pound of potatoes if over, two months. On the other days the dietary is only bread and potatoes. For breakfast and supper the dietary for all periods is eight ounces of bread and one pint of gruel, but on alternate days the oatmeal is boiled in the meat liquor. There is also a further advantage given in substituting for potatoes, when they are bad, four ounces of rice and *one ounce of treacle or sugar*. The Middlesex prisons also give six ounces of meat at one meal. In the Coldbath-fields Prison, and the House of Correction, Westminster, twenty ounces of bread are equally divided between the three meals. There is also a pint of eocoa to the highest class (exceeding two months) and one pint of gruel to others, for breakfast; whilst at supper there is one pint of gruel to the highest class, and half a pint to others. The dinner, besides bread, contains, in the highest class, six ounces of meat and eight ounces of potatoes four times per week, or one pint and a half of soup thrice per week. In the second class (two weeks to two months) there is the same quantity of meat and potatoes twice, one pint of soup twice, and one pint of gruel thrice per week. But in the lowest class it consists of bread and gruel only.

The Lincoln House of Correction at Spalding has also a dietary better than that recommended by the Government, since, in addition to the meat, there is allowed one pint of soup; but the ingredients of the soup are not stated. It has also the advantage of giving meat daily in the fourth and fifth class, apart from the soup, and thus the important article of diet is evenly distributed; and since the soup is probably made from the meat liquor, it increases the quantity of fat which is supplied to the prisoners.

The Newgate Prison, Lineoln Castle, and the Pembroke Gaol are remarkable in having but one scale of dietary each for all the prisoners, thus avoiding the fallacy whieh results from varying the dietary according to the term of imprisonment. They, however, differ very much in the quantity and quality of food which they deem to be proper for their prisoners. Thus the Newgate Prison and Lincoln Castle adopt Class 4 of the Government scheme. The Pembroke Gaol affords only one quart of oatmeal gruel (the quantity of oatmeal is not stated) and three-quarters of a pound of bread for dinner. At breakfast there is a luxury found only at this gaol, viz. tea and butter; so that the meal eonsists of *a pint and a half of tea, one pound of bread, and one ounce of butter*. The supper is composed of one quart of milk pottage (the constituents are not given) and three quarters of a pound of bread. This is a remarkable dietary, and one which on paper must be very satisfactory, except in the absence of animal food. A foot-note states that "the surgeon orders extra food when necessary;" but the nature of the food whieh he may order is not stated. The largest quantity of bread is eontained in this dietary, viz. two pounds and a half of bread daily. We should like to know the result of the entire avoidance of fresh vegetables, a circumstance also pecuiliar to this prison, if the return be true.

Another peculiarity is met with in the three Gloucester gaols (one of which, the House of Correction at Horsley, is under the direction of a name

well known in prison management), viz. the exhibition of the same food on each day of the week. The plan of varying the food with the class is pursued, but, with the exception of the third class, the food is not varied from day to day. In the lowest class the food is simply eight ounces of bread at each meal. In the second class one pint of gruel is added to the breakfast and supper. In the third class eight ounces of potatoes are added daily, and three ounces of meat twice in the week. In the fourth and fifth classes the meat is given daily, and in the fifth class the potatoes are increased to one pound. There is also another point worthy of notice which is peculiar to these gaols and the Lincoln House of Correction, Spalding, viz. the administration of meat on every day in the week to the two highest classes, apart from or to the exclusion of soup. There are thus two important circumstances redounding greatly to the credit of those who have the supervision of these institutions in the county of Gloucester.

The peculiarity of administering the same food on each day of the week is also met with at the Cardiff, Flint, Sussex, and Wilts gaols. The poverty of the Cardiff dietary has already been stated, and the Flint Prison dietary is very far removed from liberality. Thus for fourteen days it affords simply one pound of bread and four ounces and a half of oatmeal daily. For six weeks, one pound and a quarter of bread, four ounces and a half of oatmeal, and half a pint of milk daily, and for all periods beyond six weeks a quarter of a pound of bread is added daily, and two pints of soup per week.

The Sussex Prison at Lewes gives to all classes half a pound of bread and one pint of gruel for breakfast and supper. For fourteen days the dinner is eight ounces of bread only; for six weeks one pint of soup is added on three days per week; for four months the soup is given daily; and for all periods beyond, one pound of potatoes is added daily. The dietary at Petworth is more liberal. Thus, after one month the dinner consists of half a pound of bread, four ounces of meat, and one pint of soup; and after three months, one pound of potatoes is added daily. The dinner at this prison is therefore very excellent after the expiration of the first month. The two county gaols in Wiltshire have the same dietary. All prisoners not sentenced to hard labour receive one pound and a half of bread and one pint of gruel daily, and after fourteen days have one pint of soup in addition. This is all the dietary with hard labour from fourteen to forty-two days: viz., to fourteen days with hard labour the dietary is simply one pound and a half of bread and one pint of gruel daily; from six weeks to three months one pint of soup is added daily from the commencement; and when the term exceeds three months, one pound of potatoes is given daily after three months. This scheme is not equal to the Government allowance.

The dietary in the Lancaster House of Correction at Preston varies chiefly, but not exclusively, with age, viz. under æt. thirteen, under æt. seventeen, and over æt. seventeen. In these, the breakfast and supper consists of four ounces of bread and one pint of gruel, six and two-thirds ounces of bread and one pint of gruel, and six and two-thirds ounces of bread and two pints of gruel respectively.

The dinner of the first class is four ounces of bread and one pint of gruel three; four ounces of bread, four ounces of meat, and one pint of soup once; four ounces of meat and half a pound of potatoes once; four ounces of bread and one pint of soup once; and the singular combination of half a pound of potatoes with one ounce of cheese once per week. In the second class the scheme is varied simply by the administration of six and two-thirds ounces of bread daily; and the third differs from the second in doubling the

quantity of potatoes, cheese, gruel, and soup. The soup, however, does not contain meat, and the gruel is very poor.

There are certain limitations, depending upon the duration of the sentence. Thus, for seven days the diet is twelve to twenty ounces of bread daily. For fourteen days boys and girls receive half of the second-class rations, and for a month adults have half of the third-class rations. There is also a great and unique curiosity in the list of limitations which refer to itch patients, who receive but twelve ounces of bread per diem, whether as a punishment or a cure for their uncleanness is not stated. We cannot but regard this as a meagre dietary, since we cannot tell in what degree the discretionary power, which a foot-note states to rest with the governor and surgeon, in increasing the dietary after three months' imprisonment, is exercised, and, so far as adults are concerned, it appears that the only increase which can be made extends to ten ounces of bread only.

A gaol which has for its governor another gentleman of the name of Shepherd, viz. the Wakefield Gaol, is also remarkable in its dietary, but in a different direction from any of the foregoing. The peculiarity is in the greater variety of food and the care which is taken to make it palatable. The distinction into classes is maintained, and in the highest classes is so extended that it begins only after twelve months' imprisonment. The breakfast and supper are alike, except in the highest class, and consist of one pint of gruel only in the first class (seven days), whilst in the second and third six ounces of bread are added; in the fourth class eight ounces of bread are allowed, and in the fifth class the same quantity of bread is allowed, and milk substituted for gruel for breakfast, but not for supper. The dinner in the first class is one pound of bread. In the second class it consists of half a pound of bread and one pound of potatoes twice, four ounces of bread, with one pint of pea-soup or a pint and a half of gruel twice, plain pudding and one ounce of treacle once, and twelve ounces of bread alone once per week. In the third class the bread and potatoes alone is restricted to once per week; four ounces of bread, one pound of potatoes, and three ounces of cooked meat are given once; four ounces of bread, a plain pudding, and one ounce of treacle once; whilst four ounces of bread and one pint of soup, pea-soup, or Irish stew, are given four times per week. In the fourth class the bread, meat, and potatoes are given twice (once being instead of bread and potatoes alone), the other diets remaining the same. In the fifth class the bread, meat, and potatoes are given thrice, the same with half a pint of soup added twice, and bread and Irish stew alone twice per week. The soup does not contain meat, but is made from meat liquor, oatmeal, and vegetables. The pea-soup has the large quantity of six ounces of peas and four ounces of carrots per pint, with mint and pot-herbs. The Irish stew contains three or four ounces of meat with sixteen ounces of vegetables. The plain pudding is a quart made from eight ounces of flour. As the soup is partly made from bones, which are boiled for twenty-four hours, it contains a very essential article in abundance, viz. fat. Altogether, this is not only the most elaborate dietary in the return, but it seems to be the *ultima Thule* in that direction, and whatever may be its defects, it certainly evinces an anxious desire not only to feed the prisoners sufficiently, but to treat them with the consideration due to beings who have the sense of taste. Yet with this dietary, and with the entire absence of the treadwheel and the rank labour, a very large proportion of the prisoners are reported weekly as losing weight.

The Hertford Gaol at St. Albans * offers some peculiarities by which it might have been ranged with the foregoing, but it has one which is quite

distinctive, viz. *the absence of supper*. The hours of meals are not given; but the fact is stated that only breakfast and dinner are allowed, even to those condemned to hard labour, both males and females. Surely this is cruelty, and must result from gross ignorance of the wants of the system and the responsibilities of those who devised and retain the plan. If there is no excess of food left over from the previous day, in those prisons where a meal is given at 6 P.M., upon what do the St. Albans prisoners sustain the exertion of hard labour before the breakfast, when the previous meal was the dinner on the previous day? If sleeplessness results from both repletion and want of food, we should like to know how deep is the repose of the Hertfordshire felons. The unenviable refinement to which we have referred is also further seen in the absence of division of the classes by time, so that all the prisoners are fed alike during the first week of imprisonment, whether they are sentenced to hard labour or not, and for whatever duration; and after the first week the dietary is the same, except that it is varied in reference to labour, and further varied in reference to the sex condemned to hard labour. Thus there is no increase in the dietary, and hence the nature of that dietary is of vast importance. The breakfast uniformly consists of twelve ounces of bread and a pint of gruel, except when associated with hard labour, when there are sixteen ounces of bread for the men. The dinner consists of twelve ounces of bread and one pint of soup (the ingredients are not stated) four times, and twelve ounces of bread alone thrice per week. To females condemned to hard labour, the soup is given daily, and there is a further addition for males of four ounces of bread. There are thus one pound and a half or two pounds of bread given daily as in other schemes of dietary, but it is ill distributed, and whilst there are several points in the dietary to be commended, the absence of supper deserves condemnation. As a contrast to this we may refer to the Welsh gaol at Carnarvon, in which supper is not only allowed, but it is enriched by the addition of a pint to a pint and a half of broth; but to this we shall again advert.

We may now consider certain peculiarities in reference to the articles of food supplied, which have a certain degree of interest, and in a few instances affect an important principle.

In the four Northumberland gaols the quantity of oatmeal is increased and given as porridge where the Government has recommended simply gruel. This contains six ounces of oatmeal, instead of two ounces, as ordered for gruel, and milk or treacle water. There is also one pound of suet pudding given in the third, fourth, and fifth classes in place of the meat, bread, and potatoes recommended by Government. It may be questioned if one pound of suet pudding is equal to three ounces of cooked meat without bone, half a pound of bread, and half a pound of potatoes; and as the quantities of the component articles are not stated, we cannot determine such an inquiry. It has, however, this merit, which involves a principle so much neglected in prison dietary, viz. the administration of fat with the starch, and is therefore so far to be commended. It is also to be noticed to the credit of these institutions, that the dietary of the first two classes is better than that recommended by the Government, since in the first class each prisoner receives eight ounces additional oatmeal, besides milk, and in the second class there is an addition of eight ounces of potatoes to the dinner. In the return of the Alnwick House of Correction there is no provision made for prisoners sentenced to a larger term of imprisonment than six weeks, and there is specific mention of half a pint of milk in addition to one pint of porridge for the breakfast and the supper, but no bread is allowed at those meals.

The other north-country gaols, of Cumberland and Westmoreland, also make large use of oatmeal and milk in their schemes of diet, and the scheme is the same in both gaols. The quantity of bread is reduced, and to so reprehensible a degree that, for prisoners confined from seven to fourteen days, four ounces of bread alone constitute the whole dinner,—a quantity of food less than is supplied at any other prison. For seven days six ounces of bread are given at each meal; with hard labour for six weeks, and no labour for three months, one pint of soup is added to the dinner thrice, one pound of potatoes thrice, and three quarters of a pint of milk once per week; and when the terms are increased to three months, and beyond three months respectively, three ounces of cooked meat and half a pound of potatoes are given, instead of one pound of potatoes, twice per week. When the sentence of hard labour is beyond three months, four ounces of uncooked meat, four ounces of bread, and one pound of potatoes are given for dinner thrice per week, whilst one pint of soup supplants the meat thrice per week, and three-quarters of a pint of milk and six ounces of bread constitute the Sunday's dinner. The use of oatmeal is restricted to the breakfast and supper, when four or five ounces, with half a pint of milk, without bread, constitute the meal.

The Monmouth Gaol is also remarkable in the quantity of oatmeal supplied to the prisoners, and for the introduction of Indian meal as an article of diet. The two first classes are unchanged, except that the term of the second is extended to four weeks. In the third and fourth classes, which extend respectively to three months and beyond three months, the breakfast consists of no less than eight ounces of oatmeal and half a pint of milk, and the supper of six ounces of oatmeal with half a pint of milk and half a pound of bread. Both of these are largely in excess of the Government allowances, and approach much nearer to the wants of the system. The dinner in the third class consists daily of eight ounces of Indian meal and half a pint of milk, whilst in the fourth or highest class that food is administered on three days per week; four ounces of cooked meat, without bone, and twelve ounces of potatoes twice, and one pint of broth (containing three ounces of cooked meat without bone) twice in the week. We believe this to be a better dietary than that recommended by the Government; and a foot-note appended to the return is satisfactory on this head. It states: "The general health of the prisoners is good; and, *for the most part*, they leave the prison in better condition than when they came in. Prisoners of the third and fourth class are weighed on receipt and discharge; they are kept in association, and they almost invariably increase in weight while in prison." It would be interesting to know if they enter with an average weight.

A large division of the gaols which offer peculiarities of detail are the Welsh. We have already remarked that generally the dietary of the gaols of the Principality is less nutritious than that of English gaols, and we may further state that only three of the thirteen county gaols have accepted the Government scheme.

In the Carmarthen Gaol the prisoners condemned to hard labour for any term receive meat but twice per week; and that is in the form of soup, of which a quart is given; but the ingredients are not stated; twelve ounces of bread are given with it for terms exceeding two months. When the term exceeds three months two ounces of cheese and one pound of potatoes, or one pint of gruel, substitute the meat soup on three days per week; but no cheese is allowed for shorter periods; and thus a prisoner may be kept at hard labour for three months and receive twelve ounces of bread for dinner.

daily, with a quart of meat soup twicee, and one pound of potatoes, and one pint of gruel each thrie per week. The breakfast and supper invariably consist of half a pound of bread and one pint of gruel.

The Carnarvon Gaol introduces a new article of diet, and is unique in this particular, viz. buttermilk, one pint of which is added to the dinner twice per week. The whole dietary differs from that recommended by the Government, and is a subject on which the authorities of the gaol have either doubt or pride, if we may judge by the multitude of certificates which they have been pleased to append to the return. In all the classes a pint to a pint and a half of broth is administered for supper thrie per week instead of gruel, and given alone in the first two classes, but with six or eight ounes of bread in all the others. This is made from the meat liquor, with two ounces of peas, and with green vegetables, and is, therefore, a very valuable addition to the dietary. There is a diminution in the quantity of bread and an increase in that of potatoes in the proportion of two ounes of the former to half a pound of the latter. Soup is given on three days per week to prisoners condemned for periods exceeding twenty-one days; but no meat is allowed separately, except for longer periods than three months, and then three ounes of meat are given separately on three other days per week. Taken as a whole, it is an improved dietary.

The dietary of the Merioneth Gaol at Dolgelly is full of peculiarities. It introduces four new articles of diet, viz. cheese, bacon, milk, and boiled rice; but they are not all given on one day or on any fixed rota, but each is contingent: so that three ounes of bacon meat, without bone, may be substituted for eight ounes of bread and four ounes of cheese, or one quart of pea-soup or broth, and four ounes of bread; and one pound and a half of boiled rice is regarded as an equivalent for the bread and cheese in one place, and for half a pound of bread alone in another. One quart of milk and eight ounes of bread may be substituted once per week for any of the above dinners. Excepting these various contingencies, which give a complex air, the scheme is simple; for it only provides for two classes, comprehending prisoners condemned, respectively, to fourteen and exceeding fourteen days, without labour; so that a plain bread-and-cheese dinner, or any of the above-mentioned alternatives, is considered sufficient for dinner for any period, however long. Broth or soup is given for dinner to the first class. The gruel, broth, and pea-soup are each weaker than the gruel and soup recommended by the Government. We cannot but regard this dietary as defective in having so many contingencies, and those which differ much in nutritive value, whilst they are regarded as good substitutes for each other; but since the average use of each kind of diet is not stated, it is impossible to estimate the true value of this dietary. The extra food allowed for hard labour is ridiculously insufficient, viz. six ounes of bread per day; and the whole scheme demands immediate revision.

The Montgomery Gaol also provides bacon as an article of diet to the highest class, or those exceeding three months' imprisonment. The quantity allowed is two ounes without bone, added to one pound of potatoes and half a pound of bread four times per week, whilst on other days the dinner consists of one pint of soup and half a pound of bread. For periods varying from two weeks to three months, the bacon is omitted. In the first class, one pint of soup is given on the Sunday, whilst on other days the dinner consists of half a pound of bread only. Bacon as an article of prison dietary is valuable, since it supplies fat, and is also savoury.

The Denbigh County Gaol at Ruthen introduces us to another novelty,

viz., scouse, which is composed of beef cut into small pieces, and potatoes, in such proportion that one pound and a half of scouse contains 2·18 ounces of meat. This has the very patent evil of inaccurate division to each prisoner. The whole dietary is very meagre, since, for all prisoners condemned to an imprisonment exceeding a month, the dinner thrice per week is one and a half pound of scouse, half a pound of bread, and one pound of potatoes four times per week. When the term does not exceed one month, the dinner is composed of five and one-third ounces of bread and one pound of potatoes, whilst for seven days five and one-third ounces of bread only constitutes the dinner.

In the Glamorgan Gaol at Swansea, the prisoner sentenced to more than one month's imprisonment receives a bread-and-cheese dinner, as at some other Welsh gaols; but in this one pound of potatoes is added. This is given thrice per week, whilst half a pound of bread and a pint and a half of soup, containing four ounces of coarse meat, are given four times per week. No meat and cheese are allowed for a less period than one month.

Space will not permit us to continue the analysis of these returns further; but we may remark that at the Bucks and some other county prisons no extra food for hard labour is stated in the return; at the Dorset Gaol, a bread-and-cheese dinner is provided three times per week for the highest class; at Durham the dietary is reduced in value for periods up to six months; at Huntingdon there are some meaningless changes in reference to the quantity of bread allowed; at the Southampton Gaol, three ounces of cheese are considered an equivalent for one pint of soup containing four ounces of raw meat without bone, four ounces of potatoes, one ounce of rice, &c.; and at Devon, the soup contains but two ounces of raw meat per pint.

We have thus made it very evident that uniformity in dietary is not one of the characteristics of our prisons, and that those who are condemned to imprisonment receive very different treatment in different parts of the kingdom. Indeed the diversity is so great, that it would be in vain to prepare a tabular statement of the dietary of the forty-four prisons of such moderate dimensions, and with so much approach to uniformity, that even the most painstaking student could study it with the hope of understanding it; for it would be impossible to reduce the return to more general forms, with a view of comparing them and committing them to memory.

APPENDIX II.

Punishments and Dietaries of Prisoners,—Address for Returns of the punishments inflicted under sentences to "hard labour"—

Of the working of the treadwheel;

Of the pressure and working of the crank;

Of the weight of Prisoners, and the variations of it due to treadwheel and crank labour

in the City, Borough, and County Gaols of the United Kingdom:

And, of the Dietaries sanctioned for Prisoners in the City and Borough Prisons of the United Kingdom, and in those County Prisons of the United Kingdom in which the Dietary has been changed since the Return of "Dietaries for Convicts, &c." ordered by the House of Commons to be printed, 21st day of March, 1857, or in which the Dietary is not correctly set forth in that Return:—

HARD LABOUR.		TREADWHEEL.		CRANK.	
On entrance.	The punishments employed.				
On discharge.	The order in which they are used.				
Is the weight of the clothes deducted.	The length of time during which each is inflicted.				
	Men.				
	Women.				
	Height of step in inches.				
	In Summer.	Number of steps ascended per minute.	Total height in feet ascended daily.		
16 to 25.	In Winter.				
25 to 35.	Hours of treadwheel labour.				
35 to 45.	Hours of intermission.				
45 and upwards.	Total time upon the wheel daily.				
	In Summer.				
	In Winter.				
	Is each Prisoner upon the wheel daily.				
	Mode of regulating the rapidity of the revolution of the wheel.				
	Are all the places upon the wheel always filled.				
	Various amounts of pressure in lbs. required to move the eranks.				
	How is the pressure estimated and regulated.				
	Are the eranks periodically inspected and kept in easy working order.				
	Is the index within sight of the Prisoner.				
	Ordinary number of revolutions per day with different pressures.				
	Grounds and authority for variation from the ordinary number.				
	Length of handle of the crank in inches.				
	Hours of commencement and termination of the day's labour.				

WEIGHT.					
Hour of weighing.	Prisoners received in 1858, 1859, and 1860, of each age on entrance.			Average loss of weight with Treadwheel or Crank labour of all prisoners in 1860, committed with sentences of	
On entrance.	Number weighed.				
On discharge.	Total weight in lbs. on entrance.				
Is the weight of the clothes deducted.	Total gain in lbs. on discharge.				
Kind of balance, and weight required to move it when loaded with a man.	Total loss in lbs. on discharge.				
16 to 25.	1 month and under.				
25 to 35.	1 to 2 months.				
35 to 45.	2 to 3 months.				
45 and upwards.	3 to 4 months.				

Dietaries for Convicted Prisoners, in City and Borough Prisons, and in those County Prisons in which the Dietary has been changed since the Return of "Dietaries for Convicts, &c." ordered the 27th day of February, 1857.
Total quantities per week in each Scale of Dietary, in ounces and parts of an ounce.

Scale No.	No. of scale of dietary.	Duration of sentence under each scale.	On what scale commence.	Nos. of scale with treadwheel and crank labour.	Meat, cooked, and without bone.	What joints are supplied.	Bacon cooked.	Bread.	Oatmeal.	Rice.	Potatoes.	Other fresh vegetables.	Dried peas.	New.	Milk.	Skimm'd.	Cocoa, solid.	Tea, dry.	Coffec, dry.	Sugar.	Molasses.	Kitchen salt.	Fat, other than in the meat.	Water, in imperial pints.	Beer, in imperial pints.	Other articles of dietary.	Total solids.	Total fluids.
1																												
2																												
3																												
4																												
5																												
&c.																												

APPENDIX VI.—West-Riding Prison, Wakefield.

A Table showing the average Weight of Prisoners on Receipt and Discharge in each Class of Diet. (Taken for Two Years.)

	Number of Prisoners weighed.	Average weight on		
		Receipt.	Discharge.	
1856.		lbs.	lbs.	
Table 1.....	64	113·7	112·9	
,, 2	1030	124·3	122·4	
,, 3	757	121·5	119·6	
,, 4	156	128·5	129·4	
,, 5	48	127·6	125·9	
	2055	123·45	121·80	
1860.				
Table 1.....	174	128·9	128·0	
,, 2	1091	124·1	121·8	
,, 3	799	121·1	118·3	
,, 4	108	126·7	125·4	
,, 5	72	125·4	126·5	
	2244	123·50	121·29	

A Statement of the Number and Weight of Prisoners employed at the Treadmill in the West-Riding Prison at Wakefield. (Total of Classes.)

Weeks on Treadmill.	Persons.	Loss in lbs.	Average loss in lbs.
One week on Treadmill	41	108	2·63
Two weeks ,,	26	119	4·57
Three weeks ,,	10	60	6·0
Four weeks ,,	5	38	7·7

APPENDIX III.—A TABLE showing the average Loss in Weight per Male Prisoner in Nine Years, in each Class of Dietary during years 1852 to 1860, inclusive, together with a Summary of the whole. (West Riding Prison, Wakefield.)

		1852.			1853.			1854.			1855.			1856.			
Diet Tables.	No. Prisoners.	Average Loss, lbs.															
1	75	1.4	89	1.7	90	1.1	98	1.27	13	6.4	53	0.8					
2	1378	3.3	1227	4.584	1158	3.2	1145	2.562	22	1030	1963	1.9					
3	818	3.9	765	2.978	828	3.1	823	1.657	20	757	1445	1.9					
4	141	5.32	144	5.31	171	2.6	129	3.26	25	156	136 Gain	0.9					
5	74	2.8	71	2.23	77	51	61	200	33	48	81	1.7					
	2486	3.5	2296	8466	3.68	2324	6947	3.0	2256	4872	2.26	2055	3406	1.65			
Diet Tables.	1857.			1858.			1859.			1860.							
1	97	1.58½	1.6	106	63	0.6	107	101	0.9	174	164	0.9					
2	1149	2.186	1.9	1313	2870	2.2	1133	2275	2.0	1091	2612	2.4					
3	925	1.681½	1.9	890	2334	2.4	807	2379	2.9	799	2223	2.7					
4	198	2.96 Gain	1.5	156	181	1.2	131	33 Gain	0.2	108	139	1.2					
5	58	93 Gain	1.6	75	233 Gain	1.8	92	93 Gain	1.1	72	80 Gain	1.1					
	2427	3.637	1.49	2540	5215	2.0	2270	4629	2.0	2244	5058	2.21					
	Years.	No. Prisoners.	Ibs. Loss.		Average Loss.		Years.	Brought forward		No. Prisoners.	Ibs. Loss.	Average Loss.					
Summary.....		{ 1852	2486		8,664		1857	11,417		32,355		—					
.....		{ 1853	2296		8,466		1858	2,427		3,637		1.49					
.....		{ 1854	2324		6,947		1859	2,540		5,215		2.0					
.....		{ 1855	2256		4,872		1860	2,270		4,629		2.0					
.....		{ 1856	2,055		3,406			2,244		5,058		2.21					
.....		11,417	32,355		—					20,898	50,894	2.4					

APPENDIX IV.—SHOWING THE TERM OF IMPRISONMENT.

APPENDIX V.—Showing the relation of Weight to Labour.

APPENDIX VII.—Showing the relation of Weight to Age.

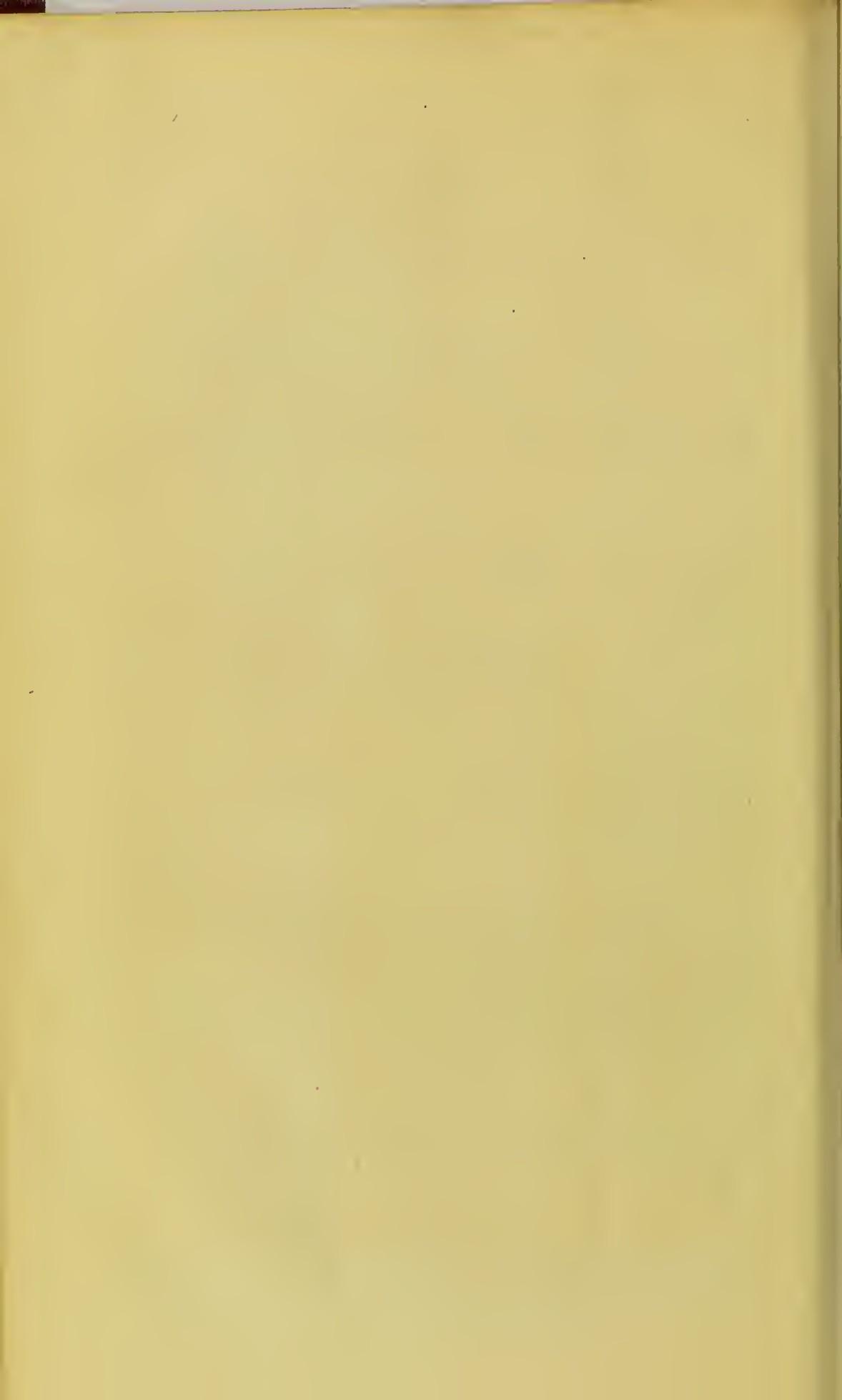
Age.	Number of Prisoners		Percentage of Prisoners		Number of Pounds		Net		Average			
	Gaining weight.	Losing weight.	Stationary.	Gaining weight.	Losing weight.	Stationary.	Gain.	Loss.	Gain per prisoner gaining.	Loss per prisoner losing.	Gain per prisoner weighed.	Loss per prisoner weighed.
17.....	62	37	22	3	59·7	35·5	4·8	273·5	99·0	174·5	7·39	4·50
18.....	288	180	100	8	62·5	34·7	2·8	1098·0	430·5	667·5	—	4·31
19.....	334	178	136	20	53·3	40·7	6·0	989·0	632·5	356·5	—	4·65
20.....	330	150	161	19	45·5	48·8	5·7	801·0	816·5	—	5·34	5·07
21—24.....	1059	414	577	38	41·9	54·5	3·6	2390·0	3518·5	—	1128·5	5·38
25—30.....	940	438	460	42	46·6	49·0	4·4	2648·0	2999·5	—	351·5	6·05
31—40.....	704	284	379	41	40·3	53·8	5·9	1830·5	2586·5	—	756·0	6·45
41 and upwards.....	283	151	116	16	53·3	41·0	5·7	985·5	657·5	—	653	5·67
Total	4000	1862	1951	187	46·5	48·8	4·7	11015·5	11740·5	—	725·0	5·92
											6·02	—
											0·18	—

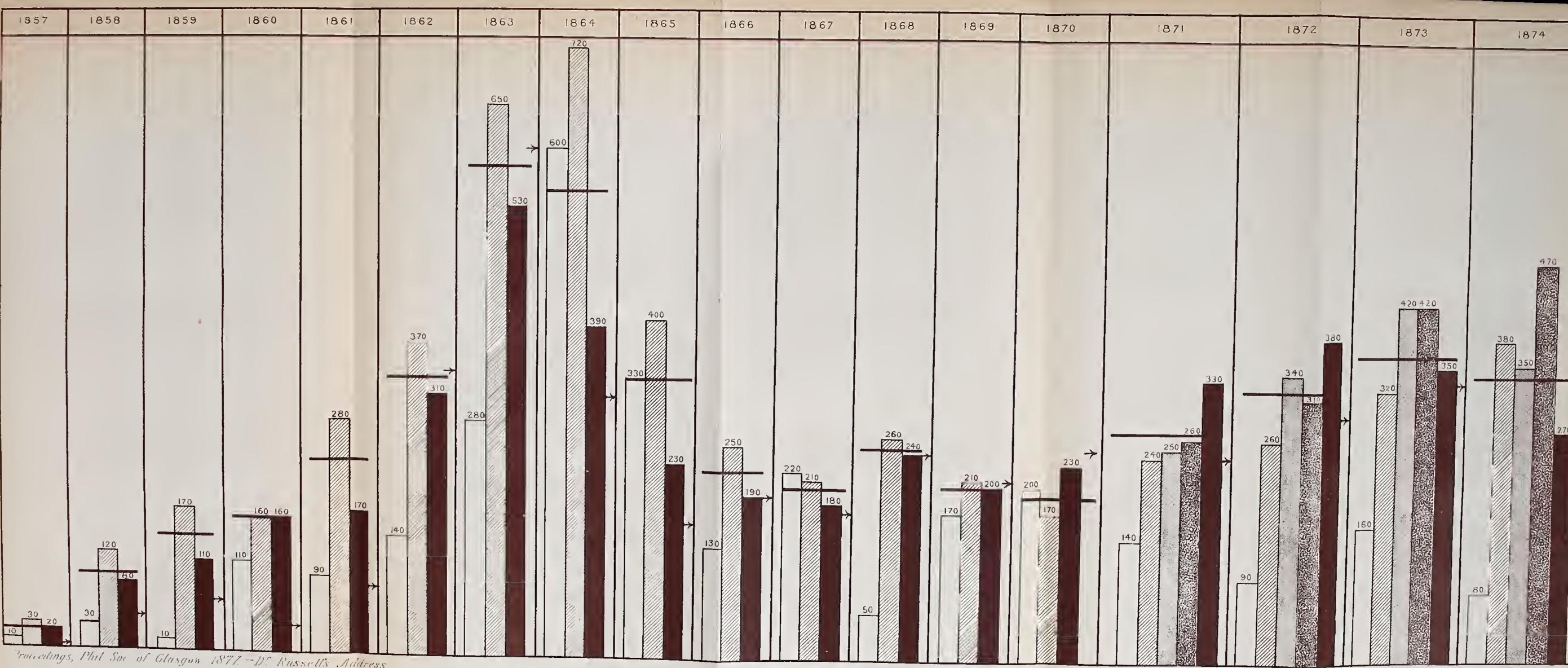
APPENDIX VIII.—Showing the relation of Weight to Height.

Height in Inches.	Number of Prisoners		Percentage of Prisoners		Number of Pounds		Net		Average			
	Gaining weight.	Losing weight.	Stationary.	Gaining weight.	Losing weight.	Stationary.	Gain.	Loss.	Gain per prisoner gaining.	Loss per prisoner losing.	Gain per prisoner weighed.	Loss per prisoner weighed.
Under 59	20	10	1	50·0	45·0	5·0	57·5	40·0	17·5	5·75	4·44	0·87
59—62	567	278	22	49·1	47·1	3·8	1570·5	1332·5	238·0	5·65	4·99	0·42
63—66	2343	1123	117	47·9	47·1	5·0	6351·0	6308·0	43·0	5·66	5·72	0·02
67—70	1005	422	46	42·0	53·4	4·6	2830·5	3782·5	—	352·0	6·71	7·04
71—74.....	65	29	35	1	44·6	53·9	1·5	206·0	277·5	—	71·5	7·10
Total	4000	1862	1951	187	4·65	48·8	4·7	11015·5	11740·5	—	325·0	5·92
											6·02	—
											0·18	35·3

APPENDIX IX.—Showing the relation of Weight to Season.

Month.	No. of prisoners weighed.	Number of Prisoners		Percentage of Prisoners		Number of Pounds	Net	Average		
		Gaining weight.	Losing weight.	Stationary.	Gaining weight.			Gain per prisoner gaining.	Loss per prisoner losing.	Gain per prisoner weighed.
January	3,879	1,645	1,918	316	42·4	49·4	8·2	3723·5	4274·0	—
February	3,747	1,561	1,808	378	41·6	48·3	10·1	3140·0	4051·0	911·0
March.....	3,632	1,058	2,272	302	29·1	62·6	8·3	1918·5	5372·5	3454·0
April	3,793	1,733	1,704	356	45·7	44·9	9·4	3710·0	3578·5	131·5
May.....	3,673	1,627	1,694	352	44·3	46·1	9·6	3825·5	3735·0	30·5
June.....	3,731	1,918	1,455	358	51·4	39·0	9·6	5322·0	3381·0	1941·0
July	3,511	1,622	1,546	343	46·2	44·0	9·8	3426·5	3135·5	291·0
August	3,446	1,903	1,211	332	55·2	30·1	9·7	4879·5	2483·0	2396·5
September.....	3,684	1,474	1,881	329	40·0	51·1	8·9	3303·0	4080·5	—
October	3,734	1,624	1,768	342	43·5	47·3	9·2	3515·0	3905·0	390·0
November	3,621	1,636	1,613	372	45·2·	44·5	10·3	3345·5	3329·5	16·0
December	3,553	1,519	1,682	352	42·8	47·3	9·9	3237·0	3356·0	—
First quarter....	11,258	4,264	5,998	996	37·9	53·3	8·8	8782·0	13697·5	—
Second quarter	11,197	5,278	4,853	1066	47·1	43·4	9·5	12857·5	10751·5	2103·0
Third quarter..	10,641	4,999	4,638	1004	47·0	43·6	9·4	11609·0	9699·0	1910·0
Fourth quarter	10,908	4,779	5,063	1066	43·8	46·4	9·8	10097·5	10590·5	—
Winter months	22,166	9,043	11,061	2062	40·8	49·9	9·3	18879·5	24288·0	5408·5
Summer months	21,838	10,277	9,491	2070	47·0	43·5	9·5	24466·5	20453·5	4013·0
Whole year	44,004	19,320	20,552	4132	43·9	46·7	9·4	43346·0	44741·5	—
								1395·5	—	1395·5
								2·24	2·18	—
								—	—	0·03

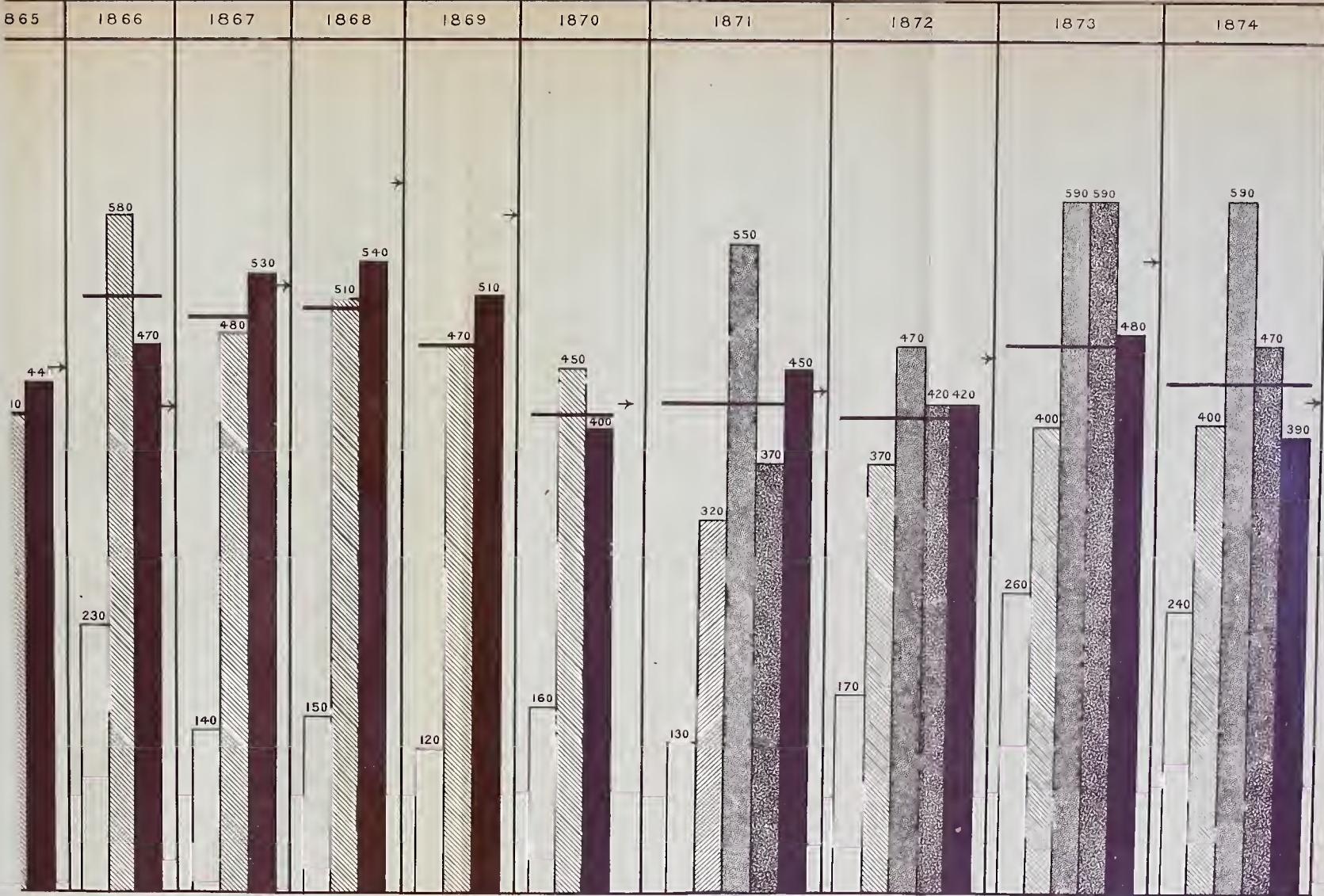




Proceedings, Phil Soc. of Glasgow 1877 - Dr. Russell's Address

DEATH RATE PER MILLION FROM DIPHTHERIA IN INSULAR RURAL, MAINLAND RURAL & TOWN DISTRICTS OF SCOTLAND.

Insular Rural Mainland Rural Principal Towns Small Towns Large Towns



DEATH RATE PER MILLION FROM ENTERIC FEVER IN INSULAR RURAL, MAINLAND RURAL & TOWN DISTRICTS OF SCOTLAND.

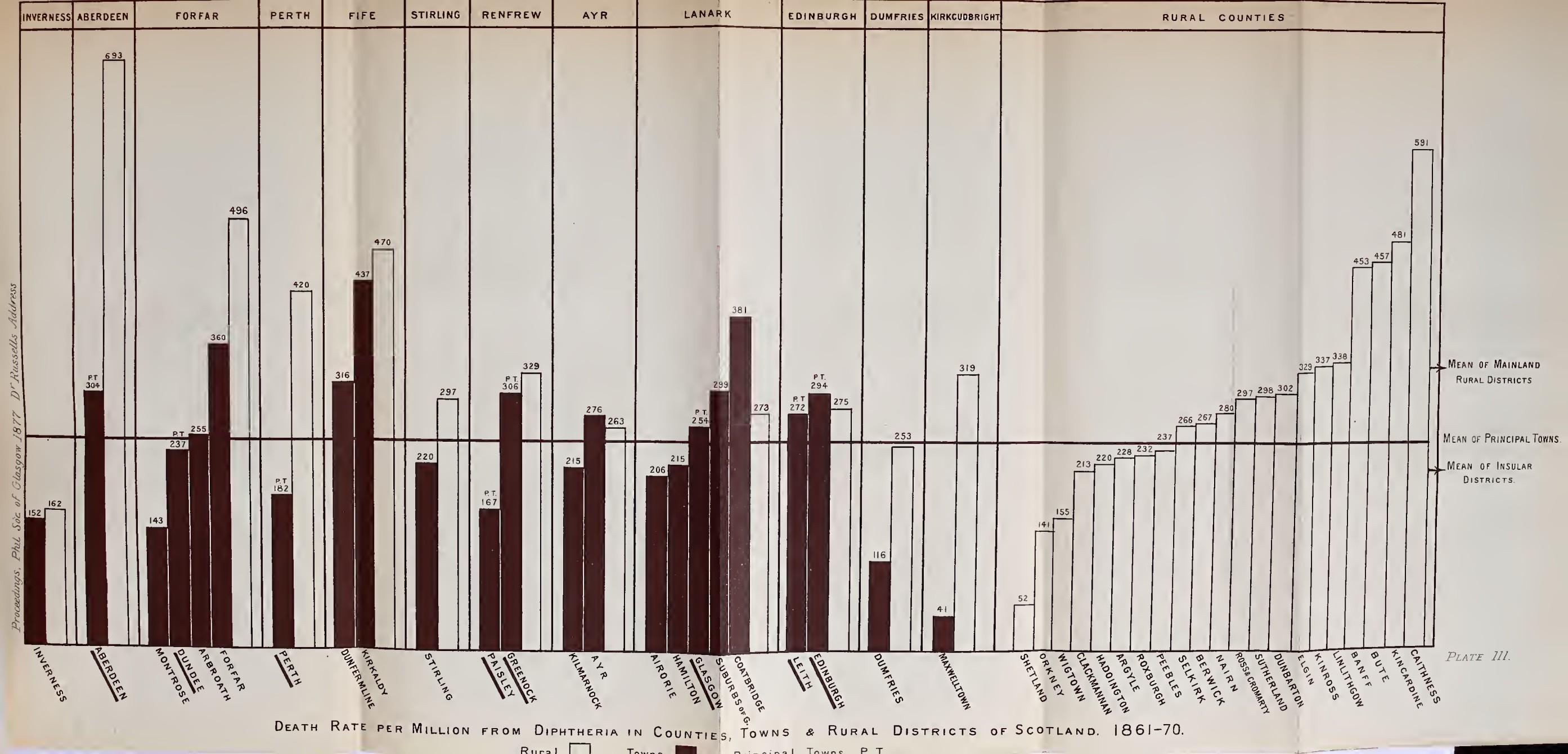
Insular Rural

Mainland Rural

Principal Towns

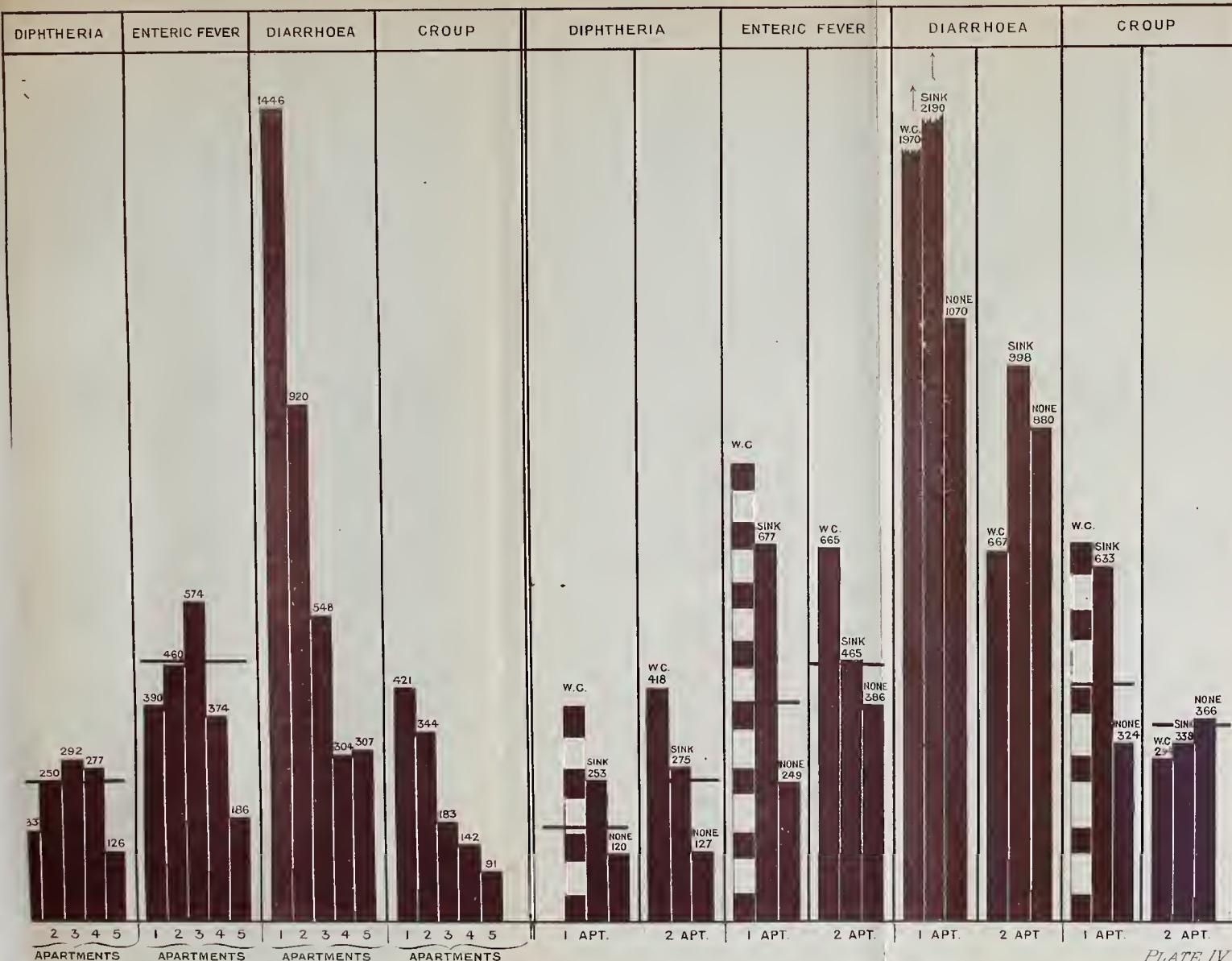
Small Towns

Large Towns



ACCORDING TO SIZE OF HOUSE.

ACCORDING TO SEWER CONNECTIONS IN SMALL HOUSES.



DEATH-RATE PER MILLION IN HOUSES OF VARIOUS SIZES IN GLASGOW. AVERAGE 1873-76.

PLATE IV

